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COMPARISON OF LIGHTNING AND NEMP: EXTRAPOLATION OF AIRCRAFT EMP SIMULATOR DATA

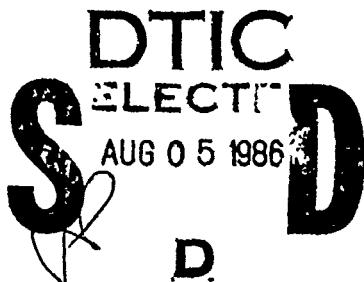
Volume III—Data - Preliminary Study

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Technical Report

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Electromagnetic Pulse (EMP)	TRESTLE Simulator																	
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Extrapolation	Aircraft Lightning Threat																	
19 ABSTRACT (Continue on reverse if necessary and identify by block number) TRESTLE Simulator Data acquired during the 1982 B-52 OAS/CMC EMP Test is extrapolated to lightning and EMP criteria. The extrapolated data is compared via study of waveform attributes. 																		
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18. SUBJECT TERMS (Continued)

Atmospheric Electricity

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CONVERSION TABLE

Conversion factors for U.S. customary
to metric (SI) units of measurement.

To Convert From	To	Multiply By
angstrom	meters (m)	1.000 000 X E -10
atmosphere (normal)	kilo pascal (kPa)	1.013 25 X E +2
bar	kilo pascal (kPa)	1.000 000 X E +2
barn	meter ² (m ²)	1.000 000 X E -28
British thermal unit (thermochemical)	joule (J)	1.054 350 X E +3
calorie (thermochemical)	joule (J)	4.181 000
cal (thermochemical)/cm ²	mega joule/m ² (MJ/m ²)	4.184 000 X E -2
curie	giga becquerel (GBq)	3.700 000 X E +1
degree (angle)	radian (rad)	1.745 329 X E -2
degree Fahrenheit	degree kelvin (K)	$t_K = (t^{\circ}F + 459.67)/1.8$
electron volt	joule (J)	1.602 19 X E -19
erg	watt (W)	1.000 000 X E -7
erg/second	meter (m)	3.048 000 X E -1
foot	joule (J)	1.355 818
foot-pound-force	meter ³ (m ³)	3.785 412 X E -3
gallon (U. S., liquid)	meter (m)	2.540 000 X E -2
inch	joule (J)	1.000 000 X E +9
jerk	Gray (Gy)	1.000 000
joule/kilogram (J/kg) (radiation dose absorbed)	terajoules	4.183
kilotons	newton (N)	4.448 222 X E +3
kip (1000 lbf)	kilo pascal (kPa)	6.894 757 X E +3
kip/inch ² (ksi)	newton-second/m ² (N·s/m ²)	1.000 000 X E +2
ktap	meter (m)	1 000 000 X E -6
micron	meter (m)	2.540 000 X E -5
mil	meter (m)	1.609 344 X E +3
mile (international)	kilogram (kg)	2.834 952 X E -2
ounce	newton (N)	4.448 222
pound-force (lbs avoirdupois)	newton-meter (N·m)	1.129 848 X E -1
pound-force inch	newton/meter (N/m)	1.751 268 X E +2
pound-force/inch	kilo pascal (kPa)	4.798 026 X E -2
pound-force/foot ²	kilo pascal (kPa)	6.894 757
pound-force/inch ² (psi)	kilogram (kg)	4.535 924 X E -1
pound-mass (lbm avoirdupois)	kilogram-meter ² (kg·m ²)	4.214 011 X E -2
pound-mass-foot ² (moment of inertia)	kilogram/meter ³ (kg/m ³)	1.601 846 X E +1
pound-mass/foot ³	**Gray (Gy)	1.000 000 X E -2
rad (radiation dose absorbed)	coulomb/kilogram (C/kg)	2.579 760 X E -4
roentgen	second (s)	1 000 000 X E -8
shake	kilogram (kg)	1.459 390 X E +1
slug	kilo pascals (Pa)	1.333 22 X E -1
torr (mm Hg, 0° C)		

*The becquerel (Bq) is the SI unit of radioactivity; 1 Bq = 1 ev./ml/s.

**The Gray (Gy) is the SI unit of absorbed radiation.

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SECTION I INTRODUCTION

This volume presents the preliminary study which was performed using a double exponential EMP criterion and lightning criteria¹. The methods used for this preliminary study were identical to those used for the final study. These methods are described in Volume I of this report. This volume will describe the criteria used in the preliminary study and discuss the results of this preliminary comparison. Appendix A contains a table of the scalar attributes of the extrapolated waveforms. Appendix B contains plots of the corrected B-52 data as well as that data extrapolated to the EMP and lightning criteria.

¹ B.G. Melander, et. al., "Atmospheric Electricity Hazards Threat Environment Definition," Boeing Document D180-27423-1, April 1983.

SECTION 2

EMP AND LIGHTNING CRITERIA

2.1 EMP CRITERION.

The EMP criterion used in the preliminary study is a double exponential waveform. The electric field is defined as:

$$E(t) = E_0(e^{-\alpha t} - e^{-\beta t}) \quad (1)$$

where

$$E_0 = 5.23 \times 10^4 \text{ V/m},$$

$$\alpha = 4.0 \times 10^6 \text{ s}^{-1}$$

and

$$\beta = 4.76 \times 10^8 \text{ s}^{-1}$$

The EMP waveform propagates as a plane wave, therefore the magnetic field is defined as:

$$H(t) = E(t)/Z_0, \quad (2)$$

where, Z_0 = impedance of free space = 377Ω .

2.2 LIGHTNING CRITERION .

The lightning criterion used in the preliminary study was defined in the Atmospheric Electricity Hazards Protection (AEHP) program. This program defined two separate lightning criteria (both moderate and severe) by study of existing lightning data. These criteria are described in terms of the lightning current, and are also double exponential waveforms. The magnetic field produced by this current can be approximated by assuming that the field is produced by uniform current on an infinite cylinder, and is given by Equation 3.

$$H(t) = I(t)/2\pi R \quad (3)$$

where R is the distance from the lightning strike.

$I(t)$ is the lightning current given by the double exponential waveform. The AEHP lightning criteria have the peak current and rise and fall rates shown in Table 1. The resulting electric fields at 50 m from the lightning stroke along with the EMP waveform are shown in Figures 1 and 2. Only the severe criterion was used in this study.

Table 1. AEHP lightning parameters.

I_0	α	β
20.6kA	$14.3 \times 10^3 \text{ s}^{-1}$	$2.5 \times 10^6 \text{ s}^{-1}$
206kA	$14.3 \times 10^3 \text{ s}^{-1}$	$1.0 \times 10^6 \text{ s}^{-1}$

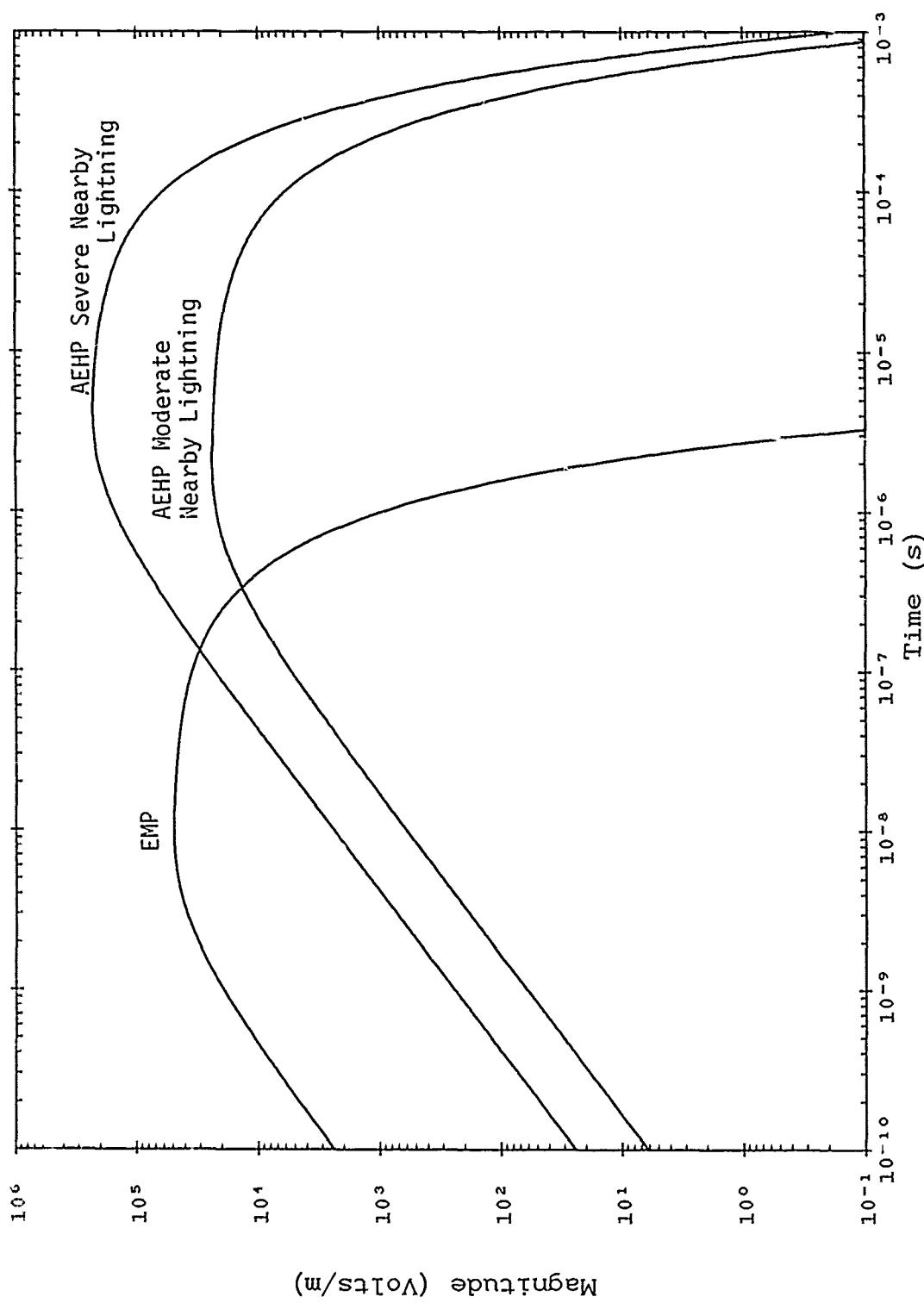


Figure 1. AEHP lightning fields and double exponential-time domain.

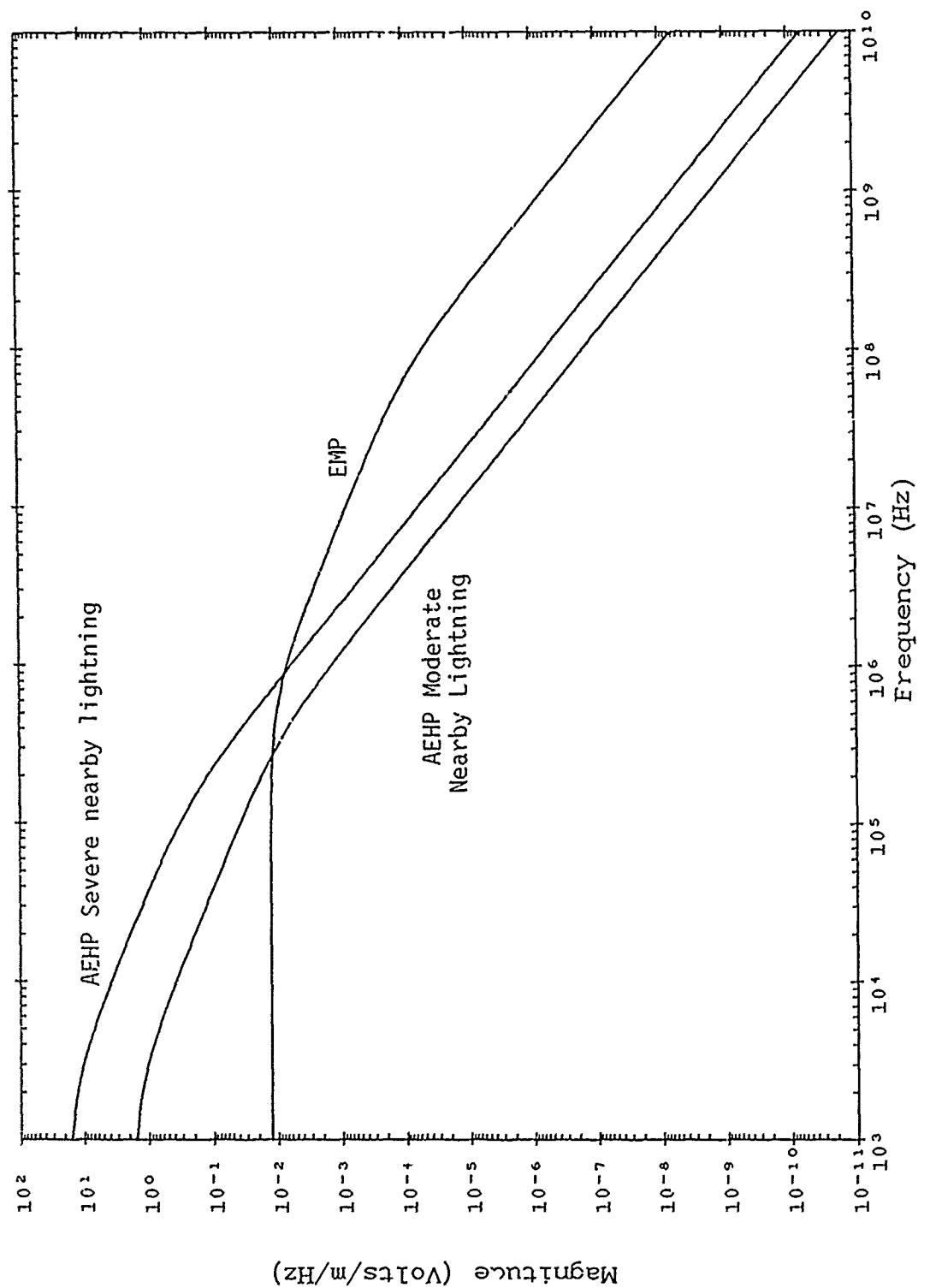


Figure 2. AEHP lightning fields and double exponential-frequency domain.

SECTION 3

COMPARISON OF EXTRAPOLATED DATA

The comparison of the responses after extrapolation to the EMP and lightning threats is accomplished via use of the waveform attributes described in Volume I of this report.

3.1 PEAK ABSOLUTE AMPLITUDE.

We can see from Figure A-2 that the peak absolute amplitude of the waveform for the EMP threat was higher than the lightning response for all cases. At frequencies above 2 MHz, the EMP magnetic field is stronger than the lightning fields. The majority of the corrected data responses resonate well above 2 MHz, thus the extrapolated responses at the resonant frequencies are stronger for EMP than lightning.

3.2 PEAK ABSOLUTE DERIVATIVE.

Figure A-4 shows that the peak absolute derivative of the EMP response is significantly greater than that of the lightning response. This is due to the difference in risetime between the two threats.

3.3 PEAK ABSOLUTE IMPULSE.

The peak absolute impulse of a waveform is related to the low frequency content. The lightning field has a larger low frequency content than the EMP field, thus the peak absolute impulse of the lightning response is generally larger than that of the EMP response.

3.4 RECTIFIED IMPULSE.

The rectified impulse comparison is shown in Figures A-7 and A-8. This parameter is not clearly worse for either EMP or lightning fields.

3.5 ROOT ACTION INTEGRAL.

The root action integral is a measure of the energy carried by the waveform. Figure A-10 shows that the EMP response almost always had a higher root action integral than the lightning response.

APPENDIX A
WAVEFORM NORM ATTRIBUTES

Table A-1. Comparison of peak absolute amplitudes.

TEST POINT	SHOT NUMBER	PEAK ABSOLUTE AMPLITUDE EMP	PEAK ABSOLUTE AMPLITUDE LIGHTNING
0059	2276	0.600E+00	0.256E+00
0141	2662	0.253E-02	0.333E-03
0434	2502	0.954E+01	0.891E+00
0504	1680	0.439E+00	0.716E-01
0516	2615	0.927E+00	0.319E+00
0594	2584	0.277E-02	0.521E-03
0643	2261	0.666E+00	0.898E-01
0705	2535	0.197E+01	0.832E+00
0715	1798	0.325E+00	0.275E-01
0723	2256	0.405E+01	0.972E+00
0903	1428	0.203E-01	0.173E-01
0918	2550	0.825E+00	0.228E+00
1182	1159	0.113E+01	0.204E+00
1473	1779	0.493E+00	0.717E-01
1660	2545	0.508E+00	0.777E-01
2238	2154	0.718E+00	0.682E-01
2391	1734	0.589E+00	0.169E+00
2426	1306	0.760E+00	0.959E-01
2717	2560	0.188E+01	0.459E+00
2866	2274	0.421E+01	0.107E+01
3313	2521	0.104E+01	0.178E+00
3313	2689	0.103E+01	0.133E+00
3385	1718	0.772E+00	0.487E-01
3473	2607	0.198E+01	0.560E+00
3539	2727	0.139E+01	0.365E+00
3543	2265	0.674E+00	0.927E-01
3615	1675	0.848E+00	0.223E+00
3626	2531	0.136E+01	0.218E+00
3795	2281	0.174E+01	0.847E-01
3884	2255	0.402E+01	0.102E+01
3919	1156	0.990E+01	0.381E+01
4050	1680	0.353E+00	0.499E-01
4225	2671	0.109E-01	0.249E-02
4309	2653	0.381E+00	0.615E-01
4597	2436	0.101E+01	0.193E+00
4859	2144	0.624E+00	0.461E-01
4914	2217	0.531E+00	0.138E+00
4924	2645	0.122E+01	0.266E+00
5169	2588	0.928E+00	0.166E+00
5283	1717	0.457E+00	0.215E+00
5352	1234	0.454E+00	0.271E-01

Table A-1. Comparison of peak absolute amplitudes (Concluded)

TEST POINT	SHOT NUMBER	PEAK ABSOLUTE AMPLITUDE EMP	PEAK ABSOLUTE AMPLITUDE LIGHTNING
5393	2623	0.272E+01	0.203E+01
5415	2700	0.660E+00	0.332E+00
5511	2274	0.243E+01	0.211E+00
5524	2584	0.107E-02	0.368E-03
5584	2687	0.152E+01	0.299E+00
5611	2308	0.243E+00	0.222E-01
5611	2501	0.652E-01	0.174E-01
5727	1180	0.405E+00	0.365E-01
5737	2165	0.120E+01	0.472E-01
5813	2606	0.966E+00	0.224E+00
5869	2271	0.416E+01	0.846E+00
6369	2584	0.510E-01	0.113E+00
6381	1151	0.601E+00	0.166E+00
6482	2501	0.434E+00	0.561E-01
6562	2501	0.256E+01	0.392E+00
6708	2712	0.148E+01	0.224E+00
6732	2712	0.199E+01	0.297E+00
7045	2260	0.380E+01	0.999E+00
7059	2226	0.135E+01	0.100E+00
7171	2504	0.720E+00	0.244E+00
7187	2266	0.731E+00	0.985E-01
7407	2166	0.864E+00	0.276E+00
7513	2638	0.770E+00	0.134E+00
7516	2528	0.415E+01	0.930E+00
7681	1720	0.330E+00	0.628E-01
7873	2626	0.408E-02	0.429E-03
8027	2594	0.530E-03	0.464E-03
8075	2460	0.721E+00	0.988E-01
8524	2151	0.711E+00	0.489E-01
8681	1797	0.476E+00	0.801E-01
8695	2478	0.120E+02	0.107E+01
8806	2197	0.184E+01	0.207E+00
8877	2276	0.768E+00	0.154E+00
9063	2265	0.981E+00	0.103E+00
9082	2609	0.960E+00	0.324E+00
9323	2605	0.128E-01	0.335E-02
9406	2421	0.811E+00	0.160E+00
9461	2628	0.110E+01	0.101E+01
9470	1684	0.252E+00	0.168E+00
9513	2618	0.107E+01	0.413E+00
9786	2697	0.389E+00	0.709E-01
9893	2551	0.424E+00	0.248E-01

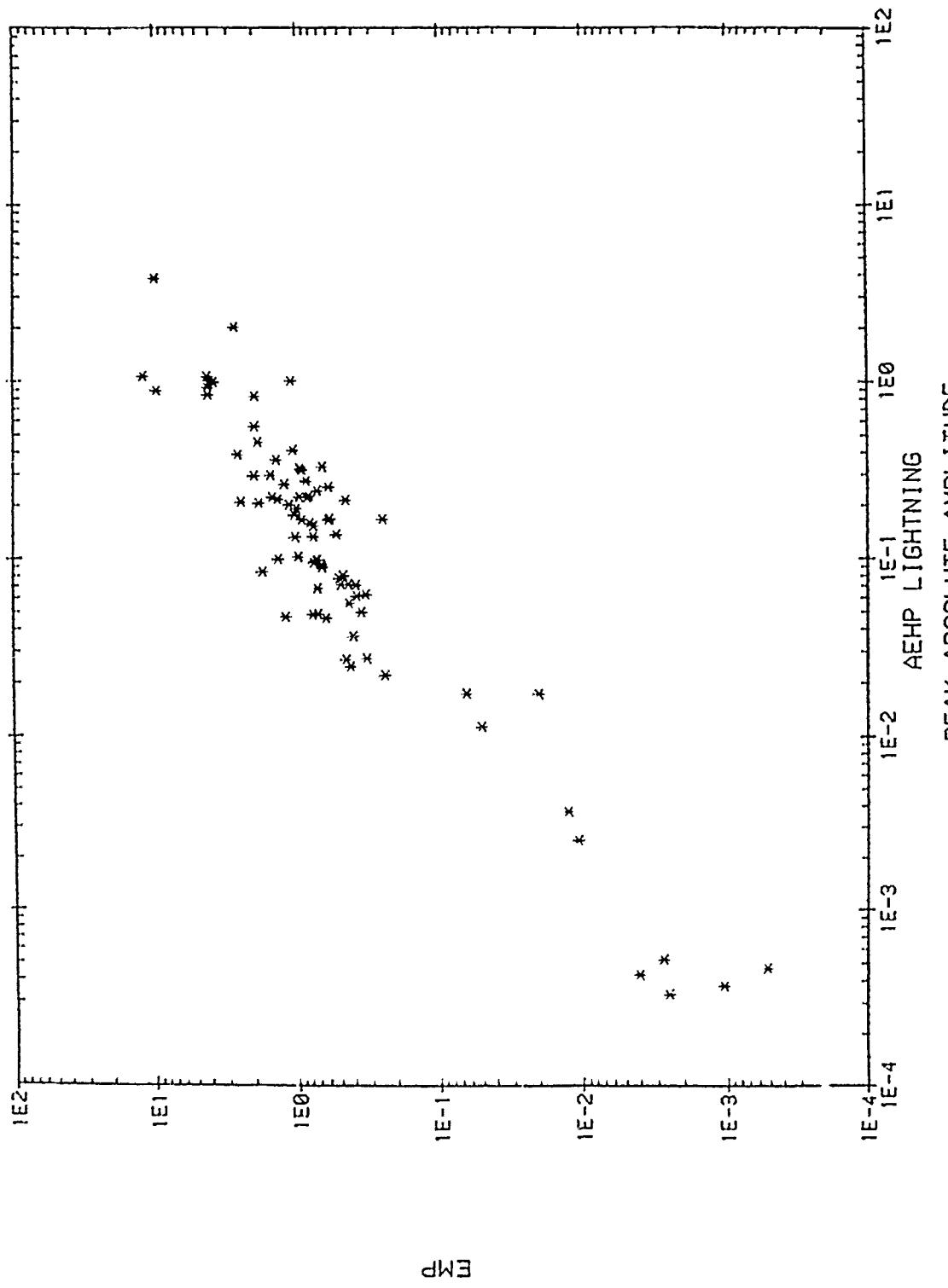


Figure A-1. Scatter plot of peak absolute amplitude.

PEAK ABSOLUTE AMPLITUDE

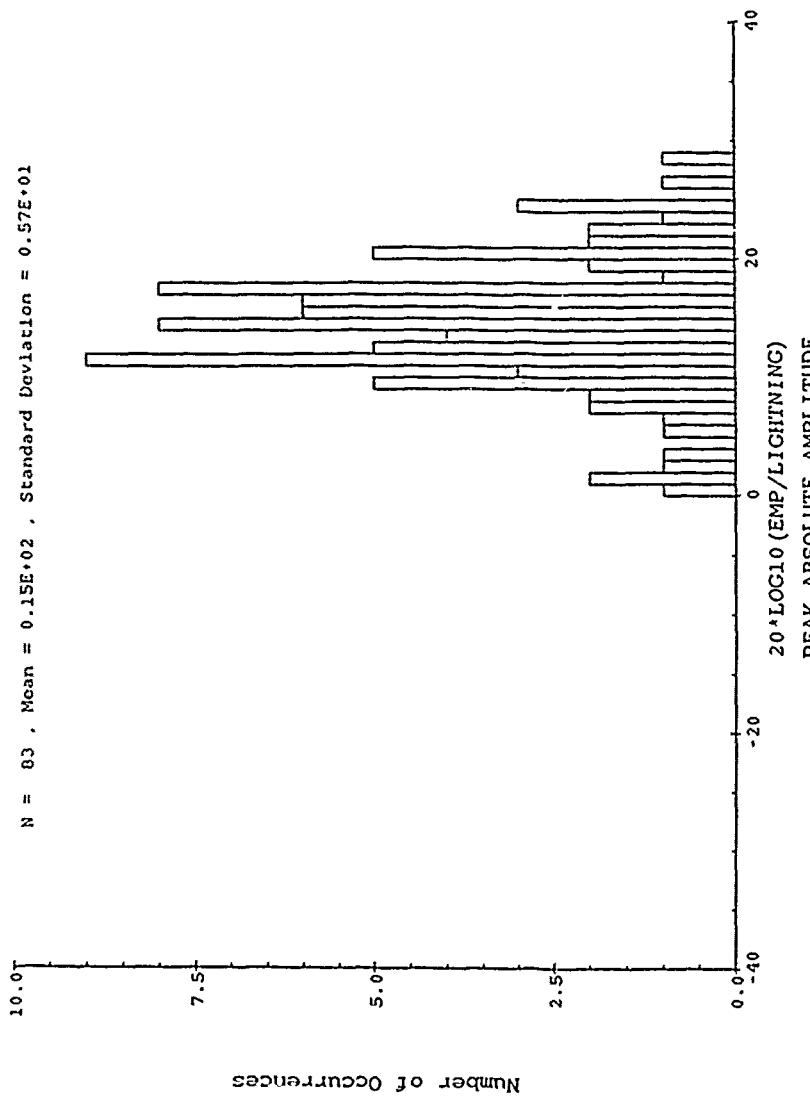


Figure A-2. Histogram of peak absolute amplitude.

Table A-2. Comparison of peak absolute derivatives.

TEST POINT	SHOT NUMBER	PEAK ABSOLUTE DERIVATIVE EMP	PEAK ABSOLUTE DERIVATIVE LIGHTNING
0059	2276	0.147E+09	0.343E+07
0141	2662	0.591E+06	0.138E+05
0434	2502	0.194E+10	0.504E+08
0504	1680	0.989E+08	0.231E+07
0516	2615	0.299E+09	0.492E+07
0594	2584	0.571E+06	0.146E+05
0643	2261	0.159E+09	0.344E+07
0705	2535	0.148E+09	0.925E+07
0715	1798	0.157E+09	0.224E+07
0723	2256	0.270E+09	0.201E+08
0903	1428	0.426E+07	0.118E+06
0918	2550	0.161E+09	0.431E+07
1182	1159	0.237E+09	0.573E+07
1473	1779	0.566E+08	0.236E+07
1660	2545	0.618E+08	0.241E+07
2238	2154	0.374E+09	0.506E+07
2391	1734	0.772E+08	0.264E+07
2426	1306	0.108E+09	0.377E+07
2717	2560	0.473E+09	0.104E+08
2866	2274	0.371E+09	0.211E+08
3313	2521	0.329E+09	0.585E+07
3313	2689	0.149E+09	0.498E+07
3385	1718	0.504E+09	0.581E+07
3473	2607	0.343E+09	0.108E+08
3539	2727	0.103E+09	0.679E+07
3543	2265	0.247E+09	0.390E+07
3615	1675	0.178E+09	0.439E+07
3626	2531	0.255E+09	0.692E+07
3795	2281	0.917E+09	0.106E+08
3884	2255	0.210E+09	0.199E+08
3919	1156	0.166E+10	0.535E+08
4050	1680	0.110E+09	0.183E+07
4225	2671	0.161E+07	0.531E+05
4309	2653	0.189E+09	0.223E+07
4597	2436	0.203E+09	0.543E+07
4859	2144	0.305E+09	0.419E+07
4914	2217	0.145E+09	0.285E+07
4924	2645	0.161E+09	0.597E+07
5169	2588	0.285E+09	0.519E+07
5283	1717	0.124E+09	0.271E+07
5352	1234	0.148E+09	0.260E+07

Table A-2. Comparison of peak absolute derivatives (Concluded)

TEST POINT	SHOT NUMBER	PEAK ABSOLUTE DERIVATIVE EMP	PEAK ABSOLUTE DERIVATIVE LIGHTNING
5393	2623	0.272E+09	0.143E+08
5415	2700	0.100E+09	0.340E+07
5511	2274	0.124E+10	0.147E+08
5524	2584	0.156E+06	0.504E+04
5584	2687	0.143E+09	0.753E+07
5611	2308	0.617E+08	0.135E+07
5611	2501	0.236E+08	0.366E+06
5727	1180	0.128E+09	0.220E+07
5737	2165	0.603E+09	0.793E+07
5813	2606	0.178E+09	0.489E+07
5869	2271	0.236E+09	0.206E+08
6369	2584	0.492E+07	0.250E+06
6381	1151	0.684E+08	0.310E+07
6482	2501	0.111E+09	0.239E+07
6562	2501	0.440E+09	0.133E+08
6708	2712	0.239E+09	0.729E+07
6732	2712	0.184E+09	0.965E+07
7045	2260	0.248E+09	0.190E+08
7059	2226	0.173E+09	0.667E+07
7171	2504	0.179E+09	0.392E+07
7187	2266	0.219E+09	0.397E+07
7407	2166	0.682E+08	0.430E+07
7513	2638	0.109E+09	0.385E+07
7516	2528	0.481E+09	0.194E+08
7681	1720	0.464E+08	0.155E+07
7873	2626	0.895E+06	0.212E+05
8027	2594	0.140E+06	0.292E+04
8075	2460	0.121E+09	0.370E+07
8524	2151	0.417E+09	0.496E+07
8681	1797	0.842E+08	0.228E+07
8695	2478	0.327E+10	0.629E+08
8806	2197	0.430E+09	0.105E+08
8877	2276	0.756E+08	0.368E+07
9063	2265	0.372E+09	0.585E+07
9082	2609	0.177E+09	0.470E+07
9323	2605	0.176E+07	0.653E+05
9406	2421	0.196E+09	0.413E+07
9461	2628	0.166E+09	0.552E+07
9470	1684	0.369E+08	0.132E+07
9513	2618	0.204E+09	0.553E+07
9786	2697	0.166E+09	0.245E+07
9893	2551	0.146E+09	0.248E+07

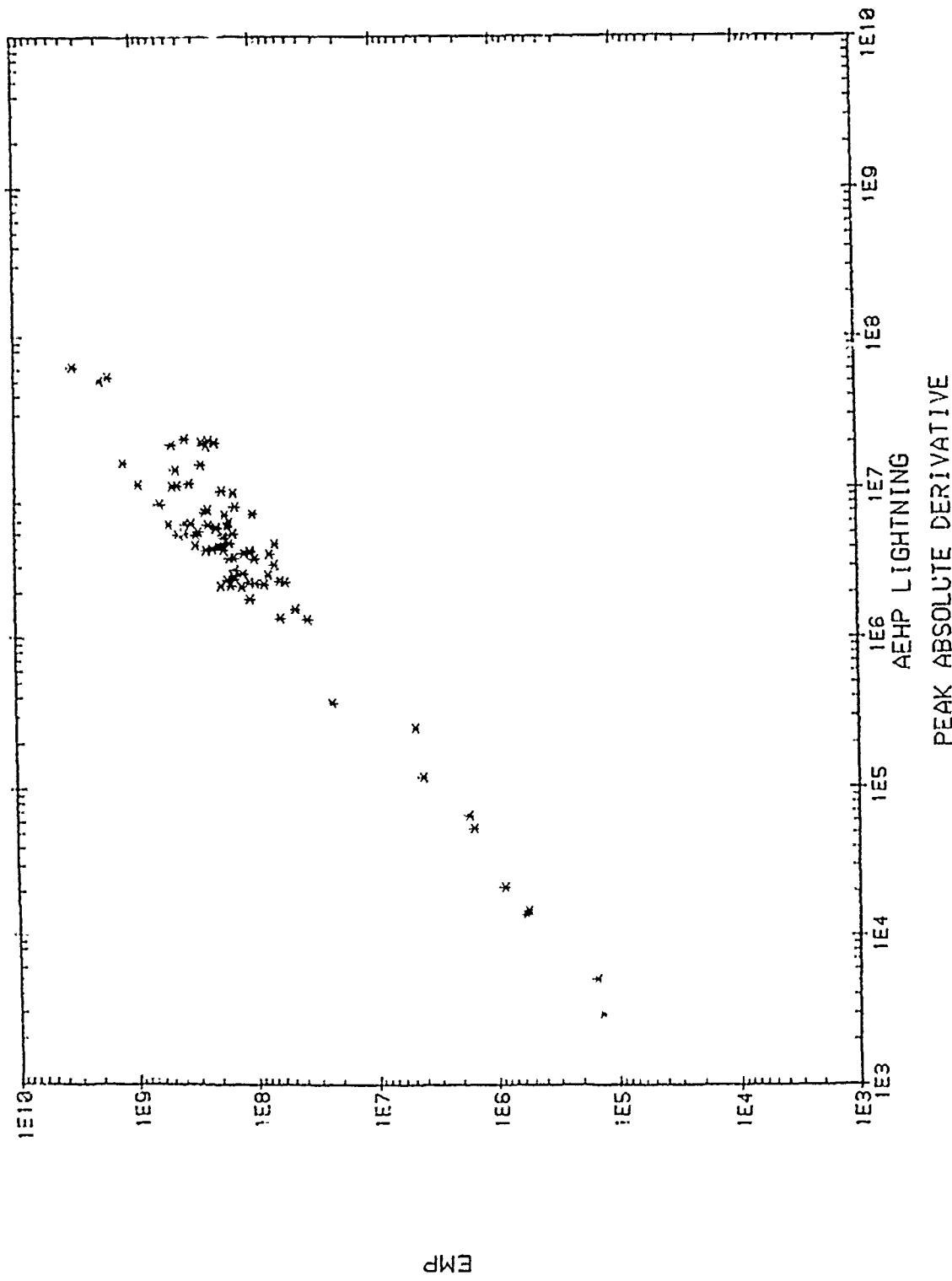


Figure A-3. Scatter plot of peak absolute derivative.

PEAK ABSOLUTE DERIVATIVE

$N = 83$, Mean = $0.31E+02$, Standard Deviation = $0.13E+01$

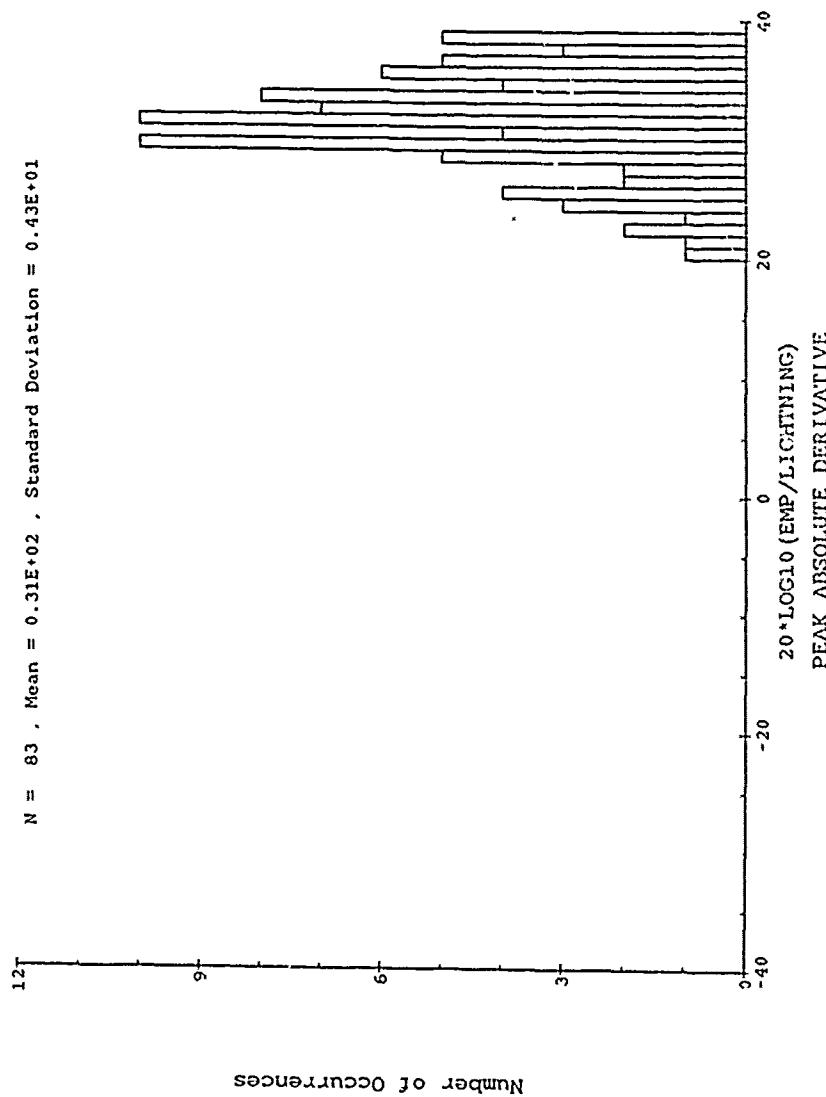


Figure A-4. Histogram of peak absolute derivative.

Table A-3. Comparison of peak absolute impulses.

TEST POINT	SHOT NUMBER	PEAK ABSOLUTE IMPULSE EMP	PEAK ABSOLUTE IMPULSE LIGHTNING
0059	2276	0.306E-07	0.177E-06
0141	2662	0.499E-10	0.300E-09
0434	2502	0.140E-06	0.915E-06
0504	1680	0.132E-07	0.116E-06
0516	2615	0.474E-07	0.946E-06
0594	2584	0.102E-09	0.309E-09
0643	2261	0.173E-07	0.611E-07
0705	2535	0.122E-06	0.122E-05
0715	1798	0.571E-08	0.398E-07
0723	2256	0.199E-06	0.843E-07
0903	1428	0.142E-08	0.472E-07
0918	2550	0.338E-07	0.333E-06
1182	1159	0.436E-07	0.379E-06
1473	1779	0.155E-07	0.257E-07
1660	2545	0.156E-07	0.565E-07
2238	2154	0.123E-07	0.106E-06
2391	1734	0.293E-07	0.750E-07
2426	1306	0.189E-07	0.191E-07
2717	2560	0.651E-07	0.715E-06
2866	2274	0.217E-06	0.134E-06
3313	2521	0.330E-07	0.223E-06
3313	2689	0.195E-07	0.223E-06
3385	1718	0.902E-08	0.109E-06
3473	2607	0.883E-07	0.143E-05
3539	2727	0.597E-07	0.180E-06
3543	2265	0.171E-07	0.265E-07
3615	1675	0.241E-07	0.487E-06
3626	2531	0.459E-07	0.368E-07
3795	2281	0.143E-07	0.230E-06
3884	2255	0.209E-06	0.283E-06
3919	1156	0.436E-06	0.902E-05
4050	1680	0.586E-08	0.698E-07
4225	2671	0.293E-09	0.307E-08
4309	2653	0.914E-08	0.100E-06
4597	2436	0.219E-07	0.394E-06
4859	2144	0.966E-08	0.319E-07
4914	2217	0.216E-07	0.555E-07
4924	2645	0.373E-07	0.776E-06
5169	2588	0.284E-07	0.746E-07
5283	1717	0.241E-07	0.543E-06
5352	1234	0.464E-08	0.738E-07

Table A-3. Comparison of peak absolute impulses (Concluded)

TEST POINT	SHOT NUMBER	PEAK ABSOLUTE IMPULSE EMP	PEAK ABSOLUTE IMPULSE LIGHTNING
5393	2623	0.273E-06	0.474E-05
5415	2700	0.393E-07	0.687E-06
5511	2274	0.389E-07	0.834E-07
5524	2584	0.301E-10	0.547E-09
5584	2687	0.496E-07	0.298E-06
5611	2308	0.340E-08	0.418E-07
5611	2501	0.337E-08	0.216E-07
5727	1180	0.505E-08	0.549E-07
5737	2165	0.873E-08	0.647E-07
5813	2606	0.402E-07	0.462E-06
5869	2271	0.186E-06	0.123E-05
6369	2584	0.167E-08	0.920E-08
6381	1151	0.362E-07	0.259E-06
6482	2501	0.109E-07	0.216E-07
6562	2501	0.593E-07	0.407E-06
6708	2712	0.279E-07	0.143E-06
6732	2712	0.595E-07	0.652E-06
7045	2260	0.199E-06	0.135E-06
7059	2226	0.237E-07	0.193E-06
7171	2504	0.365E-07	0.185E-06
7187	2266	0.198E-07	0.875E-07
7407	2166	0.492E-07	0.145E-06
7513	2638	0.219E-07	0.164E-06
7516	2528	0.132E-06	0.952E-06
7681	1720	0.121E-07	0.484E-07
7873	2626	0.550E-10	0.522E-09
8027	2594	0.390E-10	0.122E-08
8075	2460	0.213E-07	0.140E-06
8524	2151	0.103E-07	0.349E-07
8681	1797	0.134E-07	0.420E-07
8695	2478	0.178E-06	0.154E-05
8806	2197	0.322E-07	0.295E-06
8877	2276	0.304E-07	0.481E-07
9063	2265	0.206E-07	0.719E-07
9082	2609	0.579E-07	0.606E-06
9323	2605	0.720E-09	0.308E-08
9406	2421	0.366E-07	0.662E-07
9461	2628	0.107E-06	0.283E-05
9470	1684	0.221E-07	0.115E-06
9513	2618	0.542E-07	0.123E-05
9786	2697	0.862E-08	0.127E-06
9893	2551	0.341E-08	0.483E-07

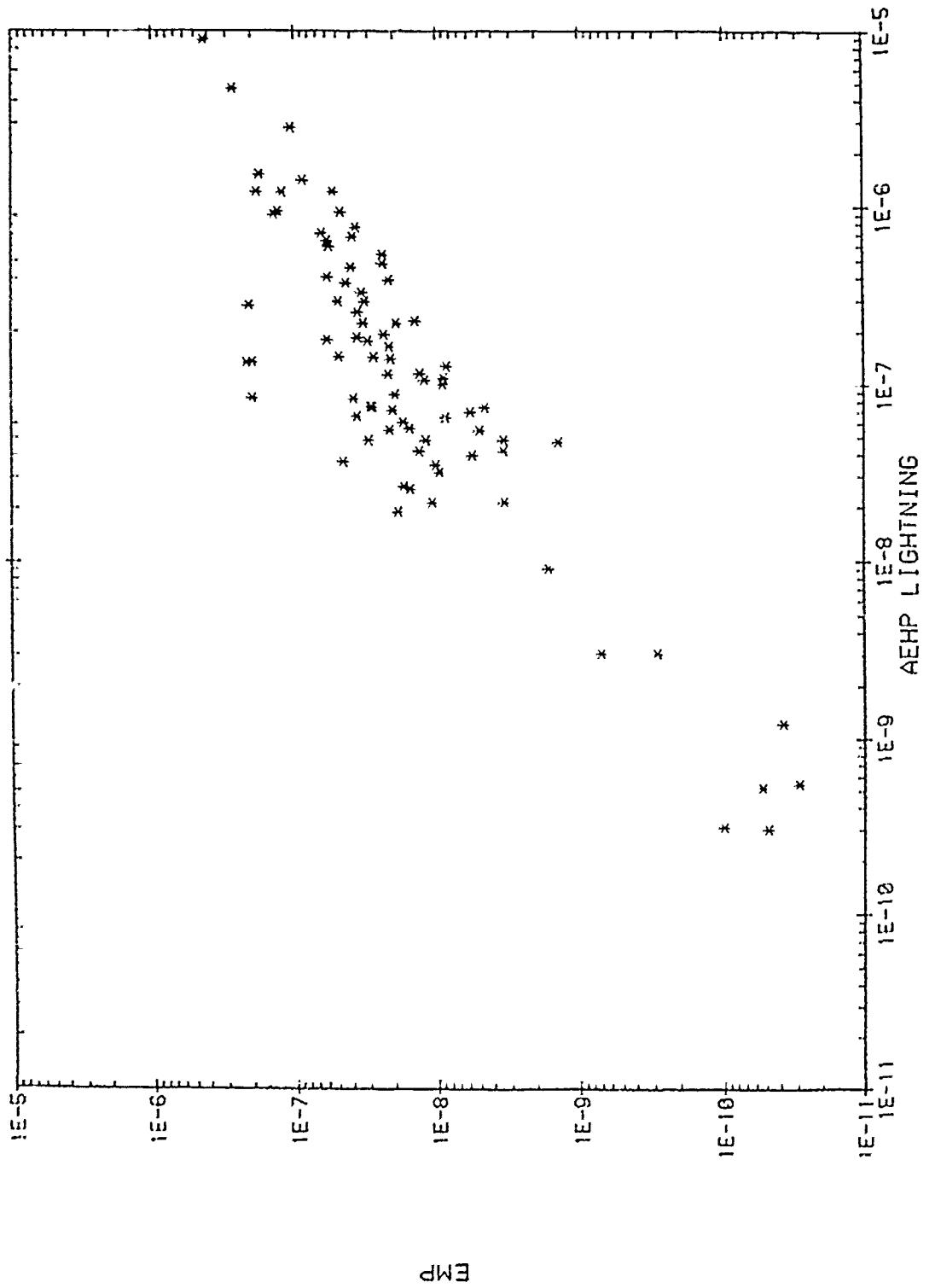


Figure A-5. Scatter plot of peak absolute impulse.

PEAK ABSOLUTE IMPULSE

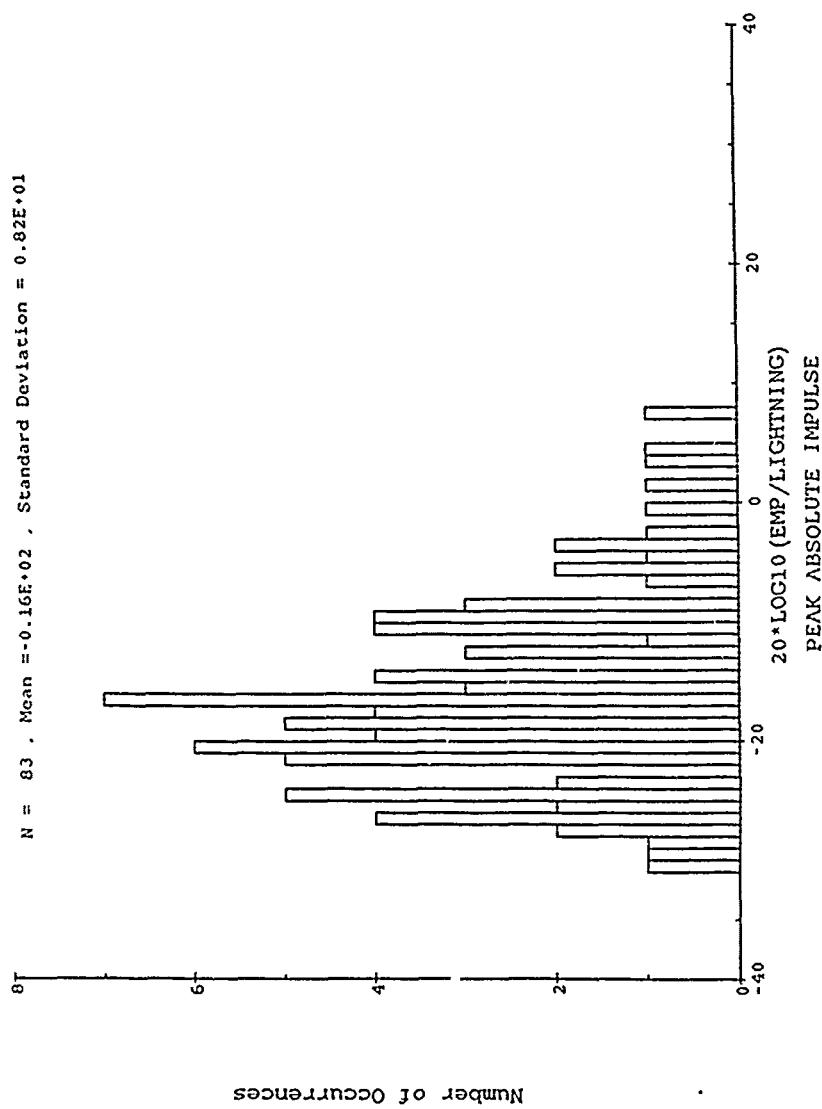


Figure A-6. Histogram of peak absolute impulse.

Table A-4. Comparison of rectified impulses.

TEST POINT	SHOT NUMBER	RECTIFIED IMPULSE EMP	RECTIFIED IMPULSE LIGHTNING
0059	2276	0.322E-06	0.330E-06
0141	2662	0.769E-09	0.586E-09
0434	2502	0.292E-05	0.211E-05
0504	1680	0.237E-06	0.187E-06
0516	2615	0.322E-06	0.995E-06
0594	2584	0.197E-08	0.419E-09
0643	2261	0.378E-06	0.149E-06
0705	2535	0.922E-06	0.157E-05
0715	1798	0.124E-06	0.502E-07
0723	2256	0.194E-05	0.552E-06
0903	1428	0.876E-08	0.525E-07
0918	2550	0.382E-06	0.559E-06
1182	1159	0.682E-06	0.451E-06
1473	1779	0.220E-06	0.561E-07
1660	2545	0.361E-06	0.111E-06
2238	2154	0.104E-06	0.114E-06
2391	1734	0.428E-06	0.167E-06
2426	1306	0.444E-06	0.108E-06
2717	2560	0.113E-05	0.778E-06
2866	2274	0.243E-05	0.620E-06
3313	2521	0.562E-06	0.248E-06
3313	2689	0.429E-06	0.292E-06
3385	1718	0.179E-06	0.127E-06
3473	2607	0.985E-06	0.170E-05
3539	2727	0.104E-05	0.427E-06
3543	2265	0.504E-06	0.111E-06
3615	1675	0.292E-06	0.585E-06
3626	2531	0.578E-06	0.162E-06
3795	2281	0.183E-06	0.254E-06
3884	2255	0.225E-05	0.714E-06
3919	1156	0.330E-05	0.944E-05
4050	1680	0.159E-06	0.111E-06
4225	2671	0.584E-08	0.480E-08
4309	2653	0.157E-06	0.143E-06
4597	2436	0.440E-06	0.510E-06
4859	2144	0.166E-06	0.627E-07
4914	2217	0.436E-06	0.185E-06
4924	2645	0.398E-06	0.826E-06
5169	2588	0.397E-06	0.170E-06
5283	1717	0.250E-06	0.657E-06
5352	1234	0.982E-07	0.773E-07

Table A-4. Comparison of rectified impulses (Concluded)

TEST POINT	SHOT NUMBER	RECTIFIED IMPULSE EMP	RECTIFIED IMPULSE LIGHTNING
5393	2623	0.983E-06	0.499E-05
5415	2700	0.470E-06	0.772E-06
5511	2274	0.751E-06	0.222E-06
5524	2584	0.417E-09	0.115E-08
5584	2687	0.622E-06	0.522E-06
5611	2308	0.411E-07	0.584E-07
5611	2501	0.312E-07	0.446E-07
5727	1180	0.981E-07	0.696E-07
5737	2165	0.206E-06	0.746E-07
5813	2606	0.600E-06	0.579E-06
5869	2271	0.223E-05	0.219E-05
6369	2584	0.288E-07	0.225E-07
6381	1151	0.374E-06	0.282E-06
6482	2501	0.244E-06	0.479E-07
6562	2501	0.114E-05	0.438E-06
6708	2712	0.397E-06	0.222E-06
6732	2712	0.763E-06	0.843E-06
7045	2260	0.197E-05	0.520E-06
7059	2226	0.436E-06	0.225E-06
7171	2504	0.551E-06	0.311E-06
7187	2266	0.518E-06	0.197E-06
7407	2166	0.661E-06	0.274E-06
7513	2638	0.411E-06	0.288E-06
7516	2528	0.175E-05	0.210E-05
7681	1720	0.245E-06	0.106E-06
7873	2626	0.146E-08	0.103E-08
8027	2594	0.297E-09	0.131E-08
8075	2460	0.356E-06	0.211E-06
8524	2151	0.144E-06	0.578E-07
8681	1797	0.230E-06	0.932E-07
8695	2478	0.297E-05	0.293E-05
8806	2197	0.304E-06	0.389E-06
8877	2276	0.363E-06	0.175E-06
9063	2265	0.453E-06	0.154E-06
9082	2609	0.589E-06	0.724E-06
9323	2605	0.822E-08	0.530E-08
9406	2421	0.563E-06	0.261E-06
9461	2628	0.650E-06	0.357E-05
9470	1684	0.257E-06	0.283E-06
9513	2618	0.362E-06	0.134E-05
9786	2697	0.711E-07	0.155E-06
9893	2551	0.818E-07	0.698E-07

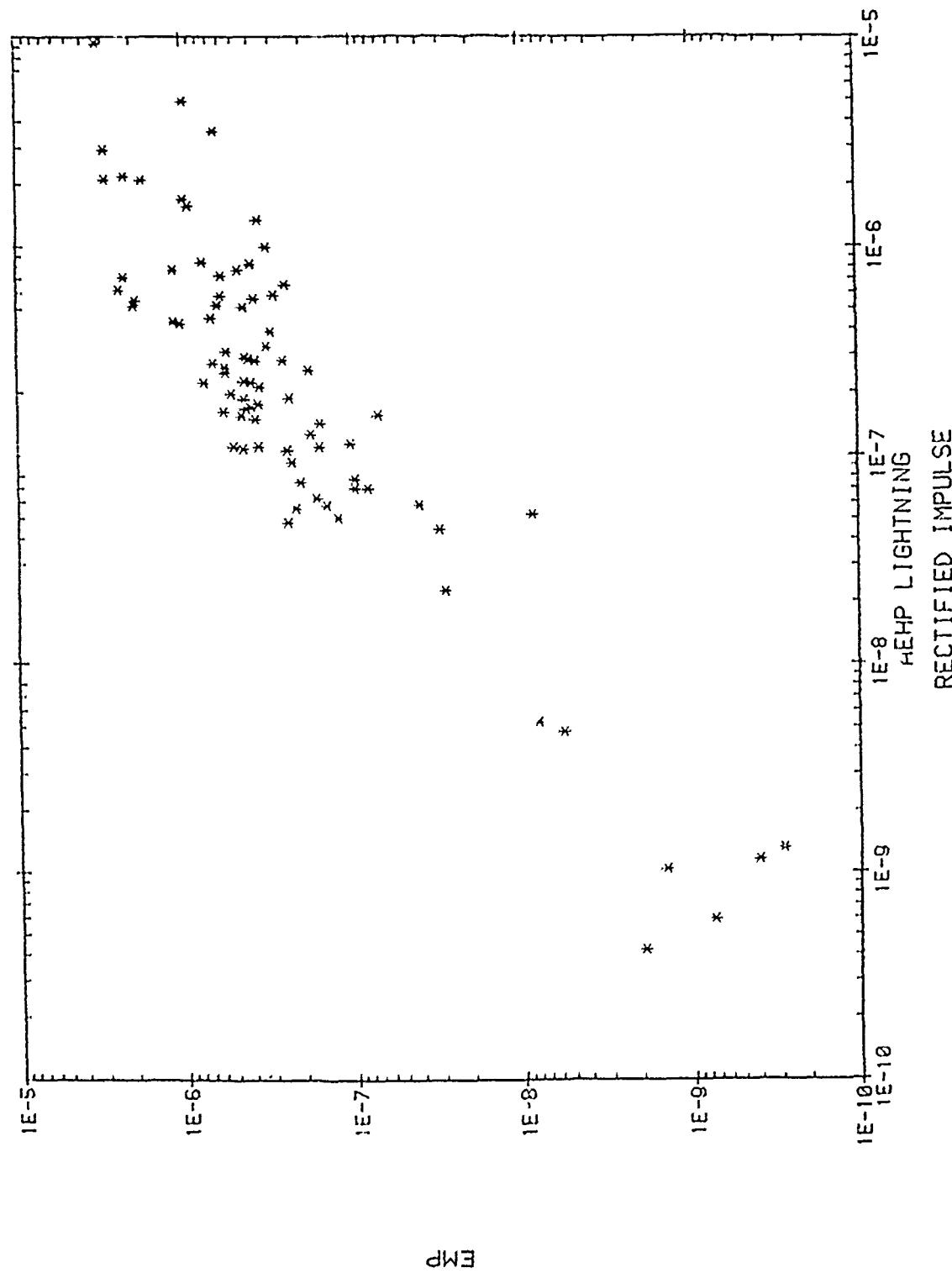


Figure A-7. Scatter plot of rectified impulse.

RECTIFIED IMPULSE

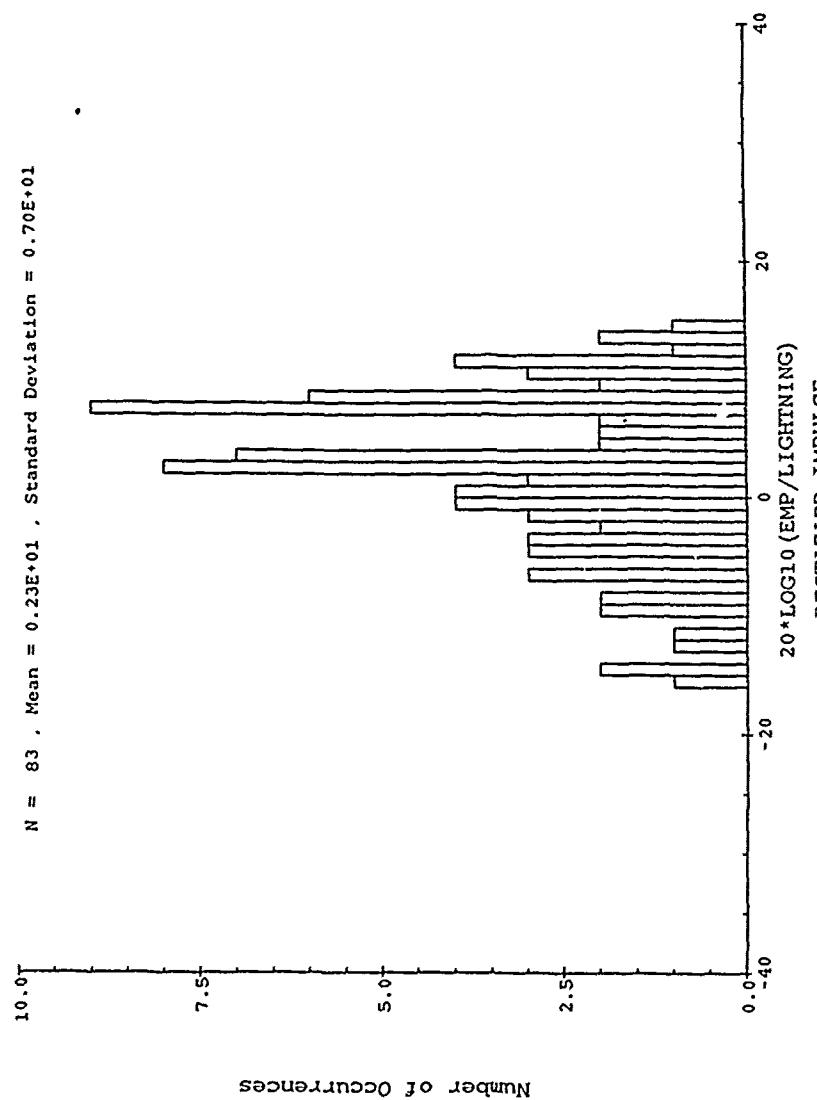


Figure A-8. Histogram of rectified impulse.

Table A-5. Comparison of root action integrals.

TEST POINT	SHOT NUMBER	ROOT ACTION INTEGRAL EMP	ROOT ACTION INTEGRAL LIGHTNING
0059	2276	0.255E-03	0.186E-03
0141	2662	0.643E-06	0.287E-06
0434	2502	0.244E-02	0.109E-02
0504	1680	0.174E-03	0.947E-04
0516	2615	0.273E-03	0.486E-03
0594	2584	0.141E-05	0.284E-06
0643	2261	0.279E-03	0.808E-04
0705	2535	0.803E-03	0.817E-03
0715	1798	0.934E-04	0.251E-04
0723	2256	0.170E-02	0.415E-03
0903	1428	0.658E-05	0.262E-04
0918	2550	0.298E-03	0.284E-03
1182	1159	0.524E-03	0.224E-03
1473	1779	0.184E-03	0.400E-04
1660	2545	0.253E-03	0.618E-04
2238	2154	0.977E-04	0.599E-04
2391	1734	0.289E-03	0.101E-03
2426	1306	0.332E-03	0.662E-04
2717	2560	0.848E-03	0.413E-03
2866	2274	0.205E-02	0.482E-03
3313	2521	0.403E-03	0.134E-03
3313	2689	0.321E-03	0.158E-03
3385	1718	0.152E-03	0.609E-04
3473	2607	0.686E-03	0.809E-03
3539	2727	0.808E-03	0.246E-03
3543	2265	0.363E-03	0.672E-04
3615	1675	0.235E-03	0.296E-03
3626	2531	0.517E-03	0.111E-03
3795	2281	0.207E-03	0.125E-03
3884	2255	0.191E-02	0.469E-03
3919	1156	0.289E-02	0.505E-02
4050	1680	0.128E-03	0.555E-04
4225	2671	0.437E-05	0.245E-05
4309	2653	0.116E-03	0.729E-04
4597	2436	0.338E-03	0.257E-03
4859	2144	0.117E-03	0.333E-04
4914	2217	0.267E-03	0.112E-03
4924	2645	0.343E-03	0.390E-03
5169	2588	0.310E-03	0.940E-04
5283	1717	0.182E-03	0.318E-03
5352	1234	0.986E-04	0.384E-04

Table A-5. Comparison of root action integrals (Concluded)

TEST POINT	SHOT NUMBER	ROOT ACTION INTEGRAL EMP	ROOT ACTION INTEGRAL LIGHTNING
5393	2623	0.967E-03	0.260E-02
5415	2700	0.349E-03	0.401E-03
5511	2274	0.575E-03	0.134E-03
5524	2584	0.364E-06	0.556E-06
5584	2687	0.552E-03	0.264E-03
5611	2308	0.452E-04	0.297E-04
5611	2501	0.259E-04	0.219E-04
5727	1180	0.836E-04	0.371E-04
5737	2165	0.203E-03	0.389E-04
5813	2606	0.481E-03	0.287E-03
5869	2271	0.185E-02	0.110E-02
6369	2584	0.242E-04	0.113E-04
6381	1151	0.289E-03	0.141E-03
6482	2501	0.176E-03	0.299E-04
6562	2501	0.927E-03	0.278E-03
6708	2712	0.302E-03	0.142E-03
6732	2712	0.688E-03	0.419E-03
7045	2260	0.171E-02	0.422E-03
7059	2226	0.360E-03	0.108E-03
7171	2504	0.355E-03	0.177E-03
7187	2266	0.362E-03	0.967E-04
7407	2166	0.459E-03	0.174E-03
7513	2638	0.289E-03	0.143E-03
7516	2528	0.153E-02	0.103E-02
7681	1720	0.163E-03	0.562E-04
7873	2626	0.120E-05	0.511E-06
8027	2594	0.213E-06	0.653E-06
8075	2460	0.288E-03	0.109E-03
8524	2151	0.118E-03	0.321E-04
8681	1797	0.183E-03	0.524E-04
8695	2478	0.260E-02	0.145E-02
8806	2197	0.284E-03	0.207E-03
8877	2276	0.312E-03	0.925E-04
9063	2265	0.352E-03	0.847E-04
9082	2609	0.469E-03	0.344E-03
9323	2605	0.632E-05	0.270E-05
9406	2421	0.372E-03	0.137E-03
9461	2628	0.469E-03	0.171E-02
9470	1684	0.155E-03	0.166E-03
9513	2618	0.290E-03	0.648E-03
9786	2697	0.694E-04	0.796E-04
9893	2551	0.775E-04	0.346E-04

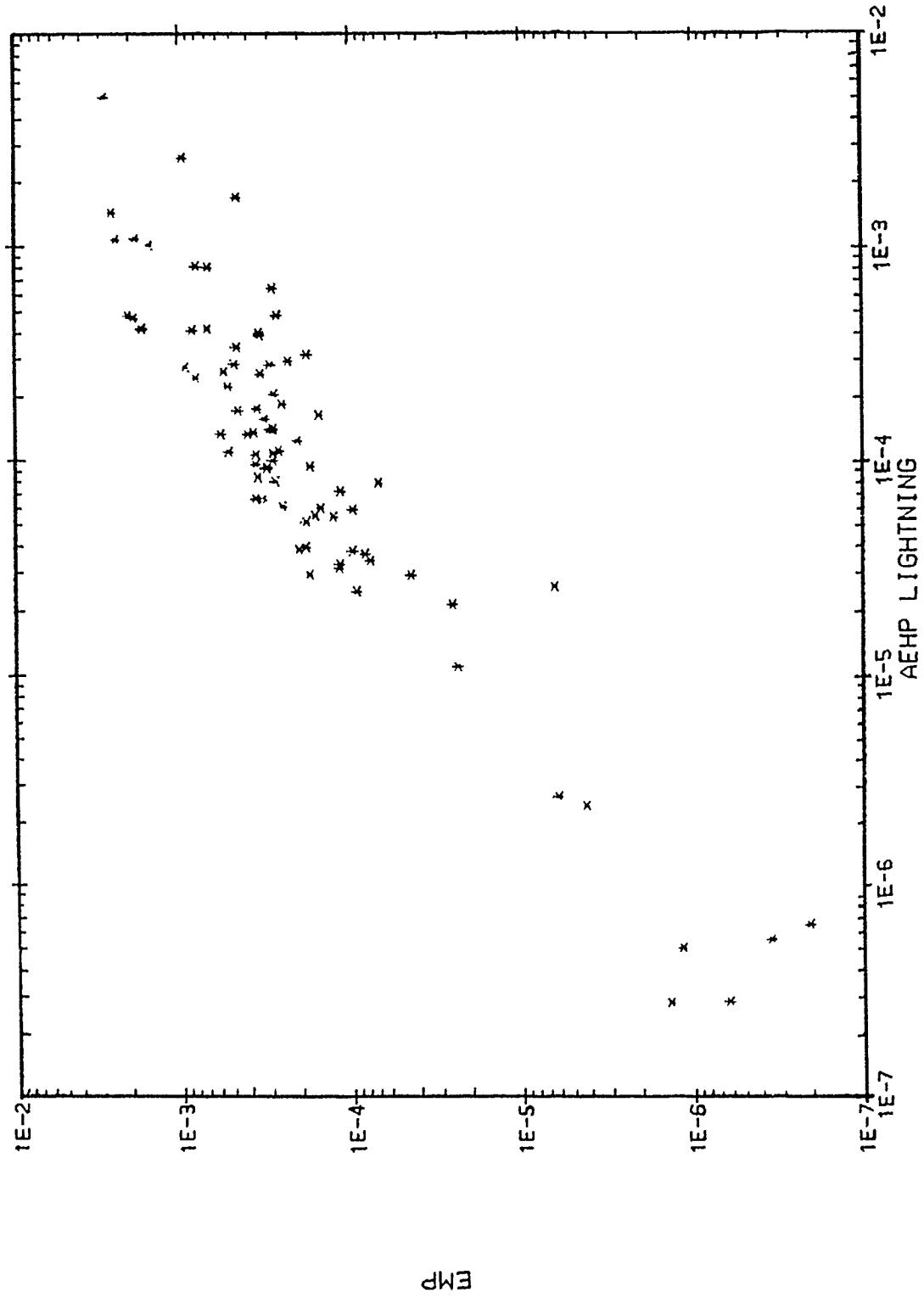


Figure A-9. Scatter plot of root action integral.

ROOT ACTION INTEGRAL

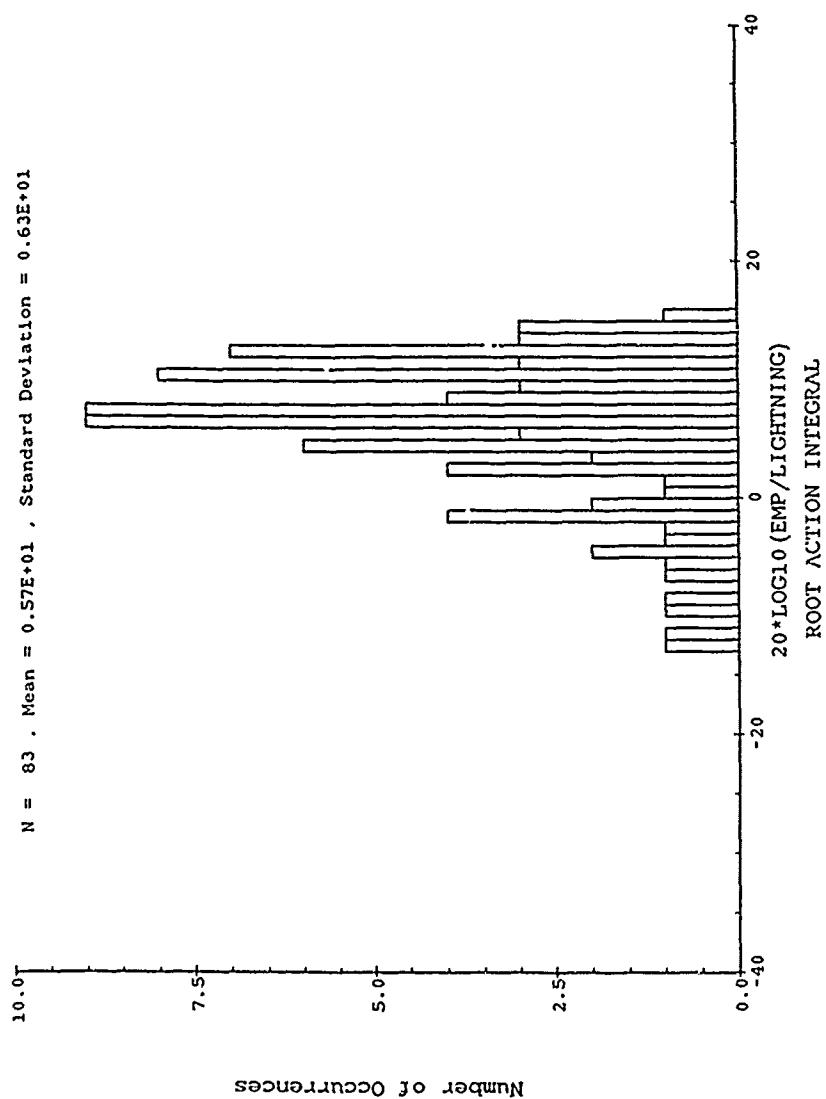


Figure A-10. Histogram of root action integral.

**APPENDIX B
DATA PLOTS**

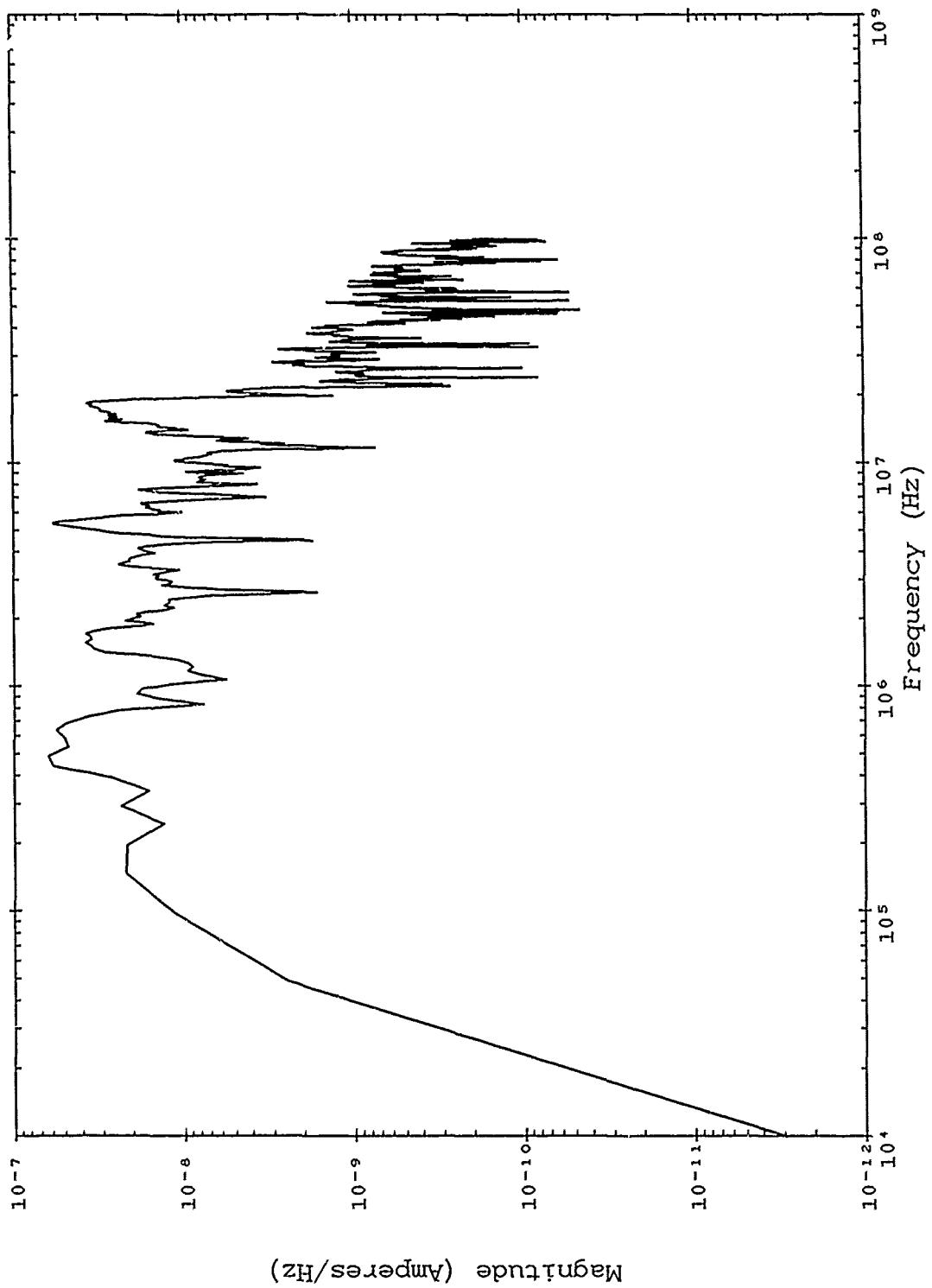


Figure B-1. Corrected TRESTLE data; TP 0059 SN 2276.

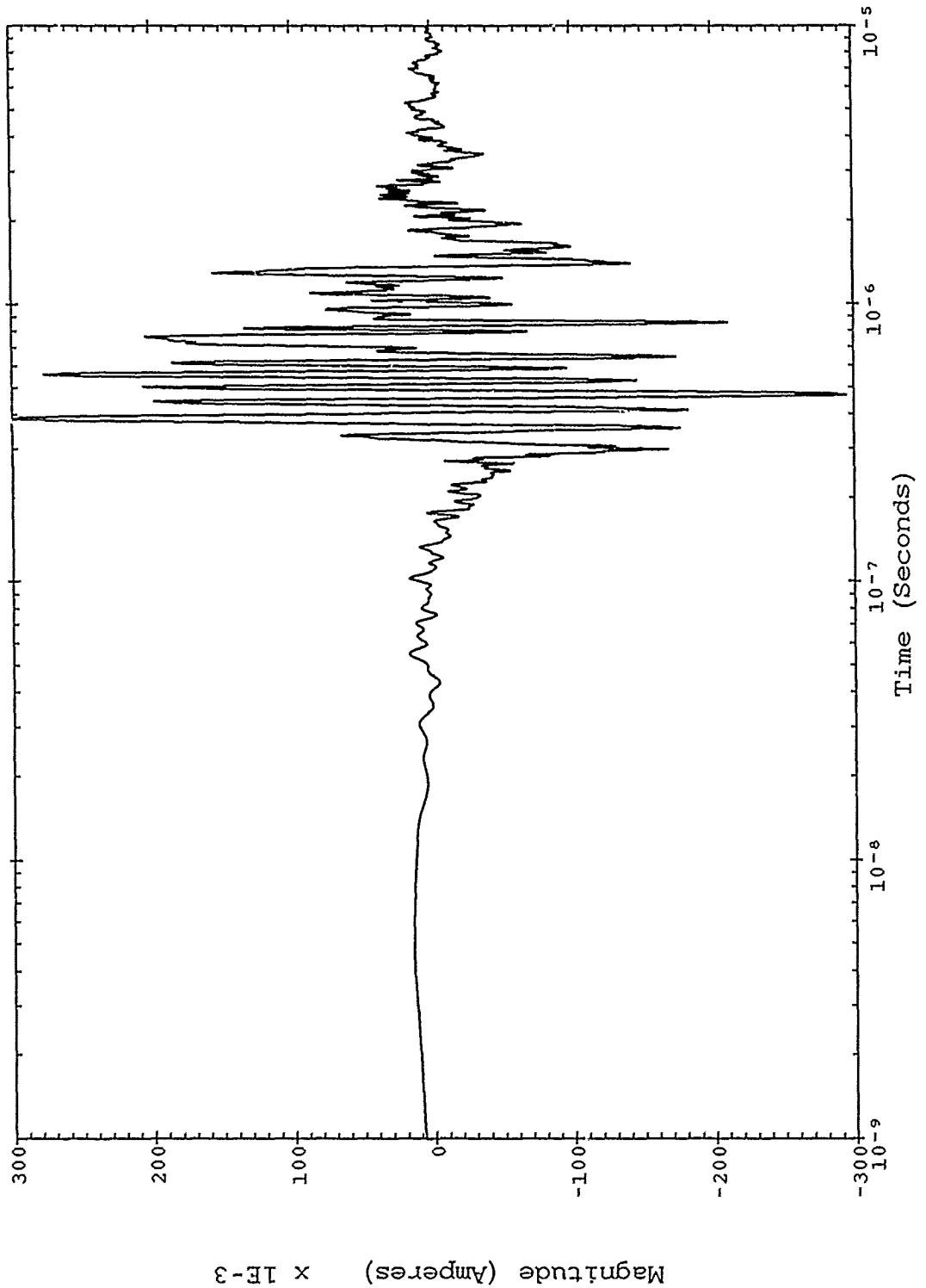


Figure B-2. Corrected TRESTLE data; TP 0059 SN 2276.

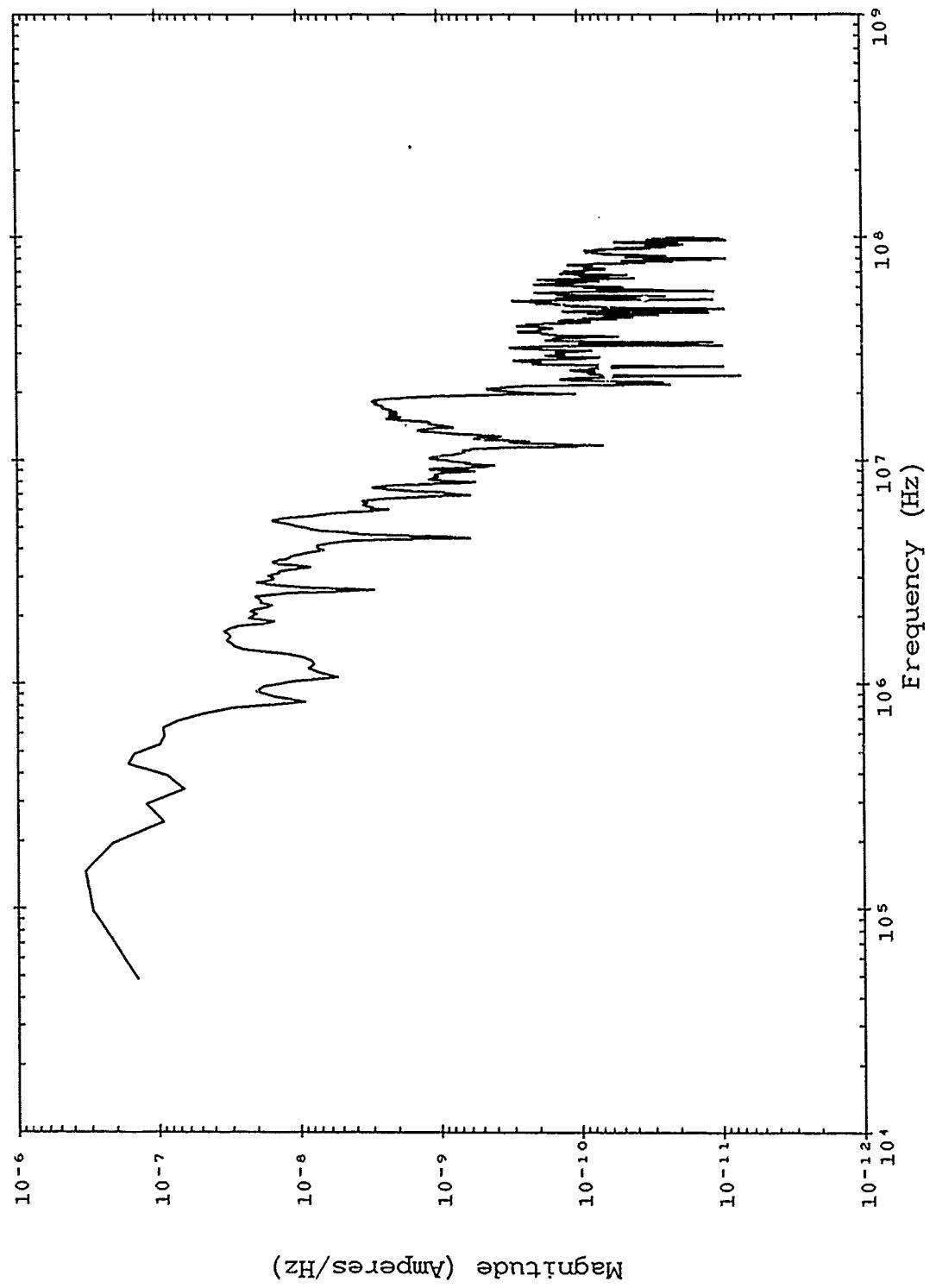


Figure B-3. Severe nearby lightning threat; TP 0059 SN 2276.

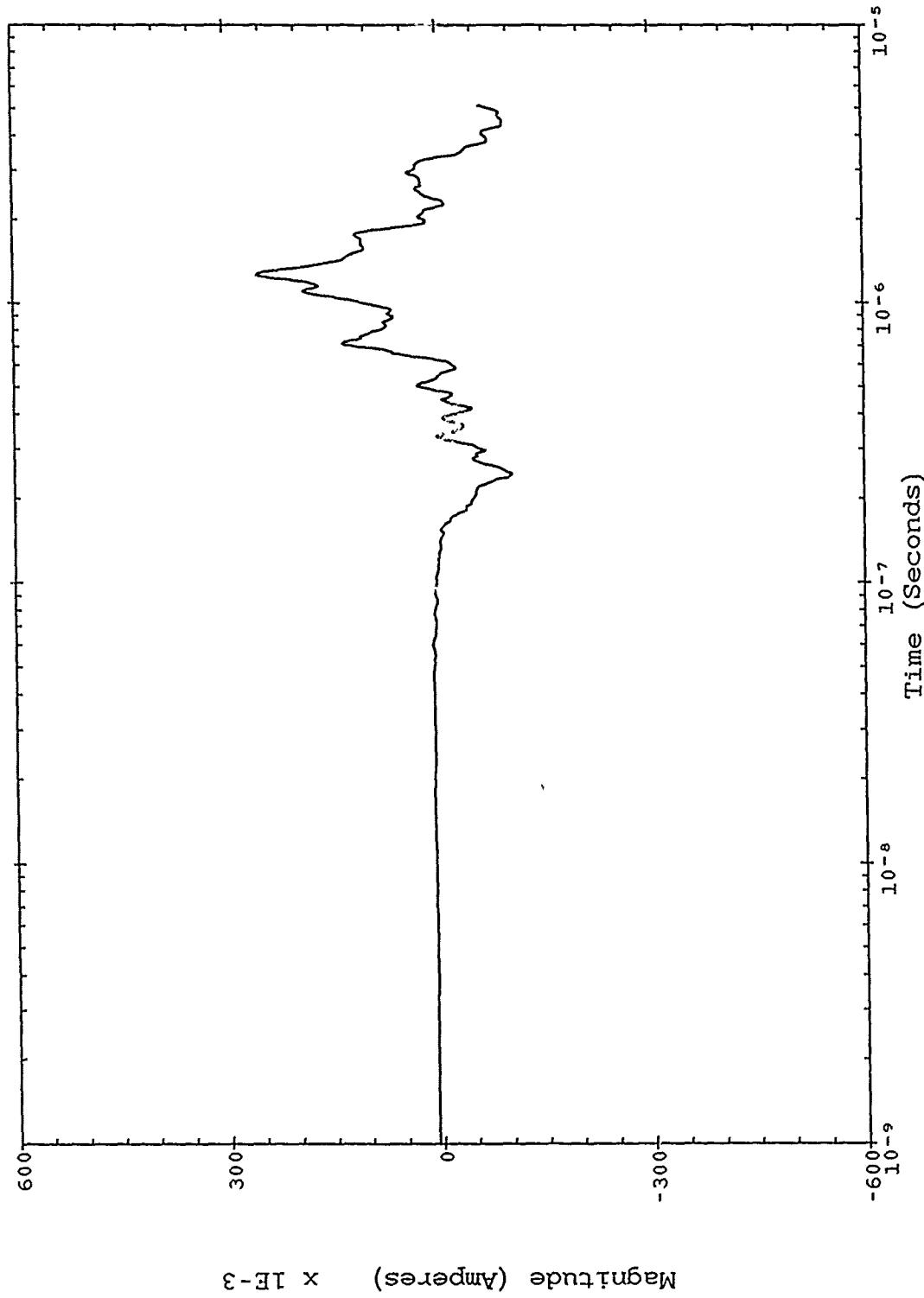


Figure B-4. Severe nearby lightning threat; TP 0059 SN 2276.

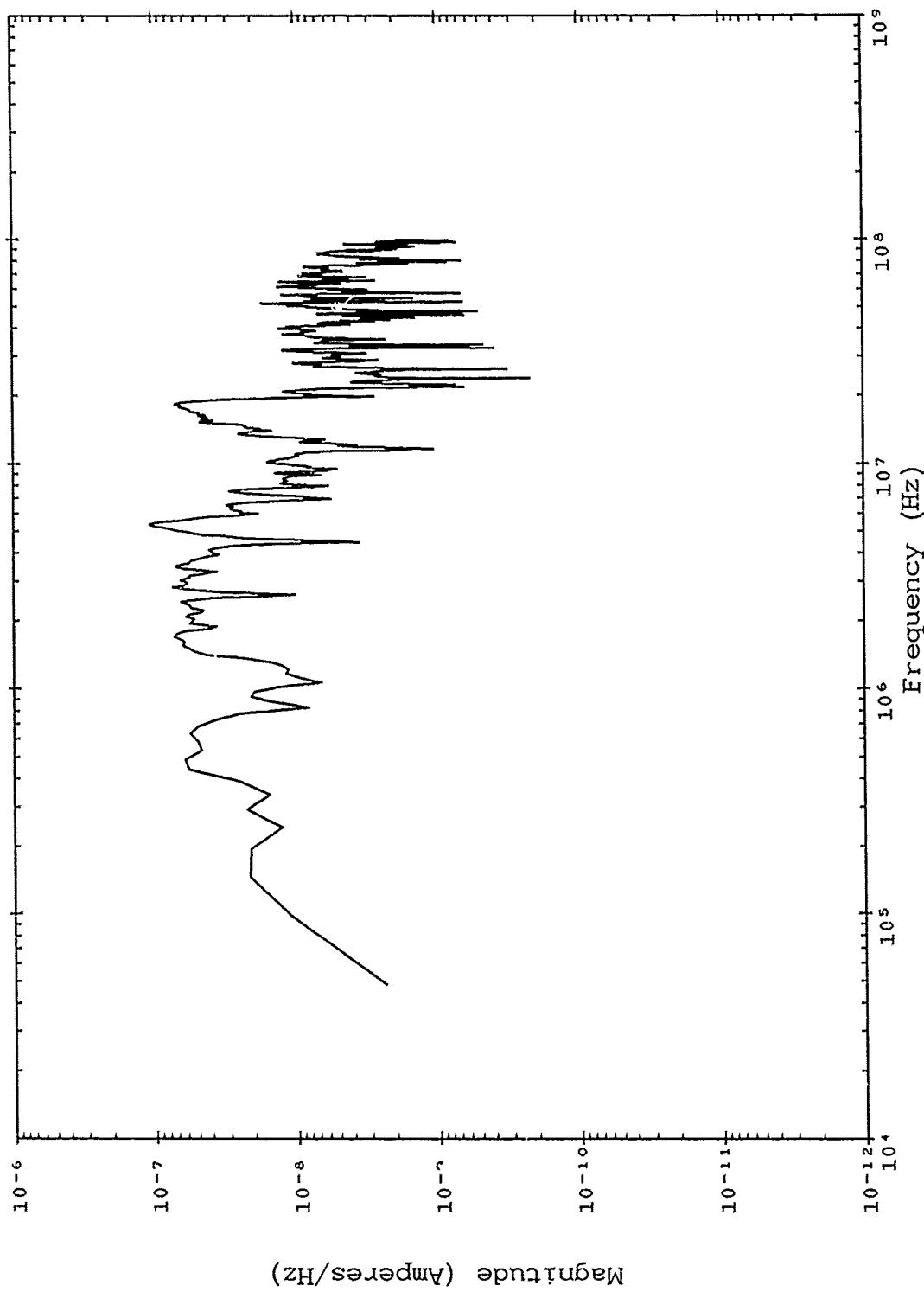


Figure B-5. Double exponential threat; TP 0059 SN 2276.

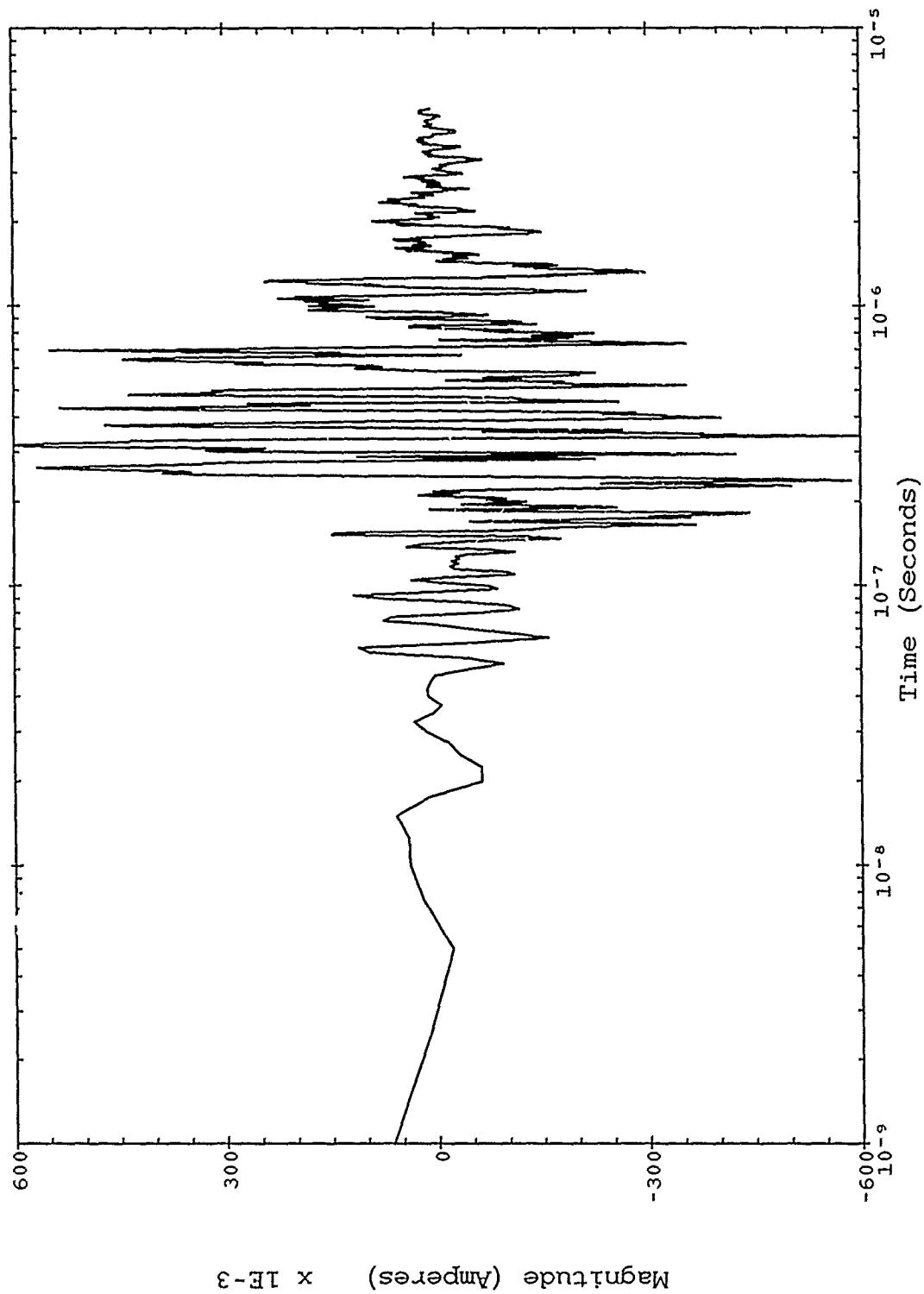


Figure B-6. Double exponential threat; TP 0059 SN 2276.

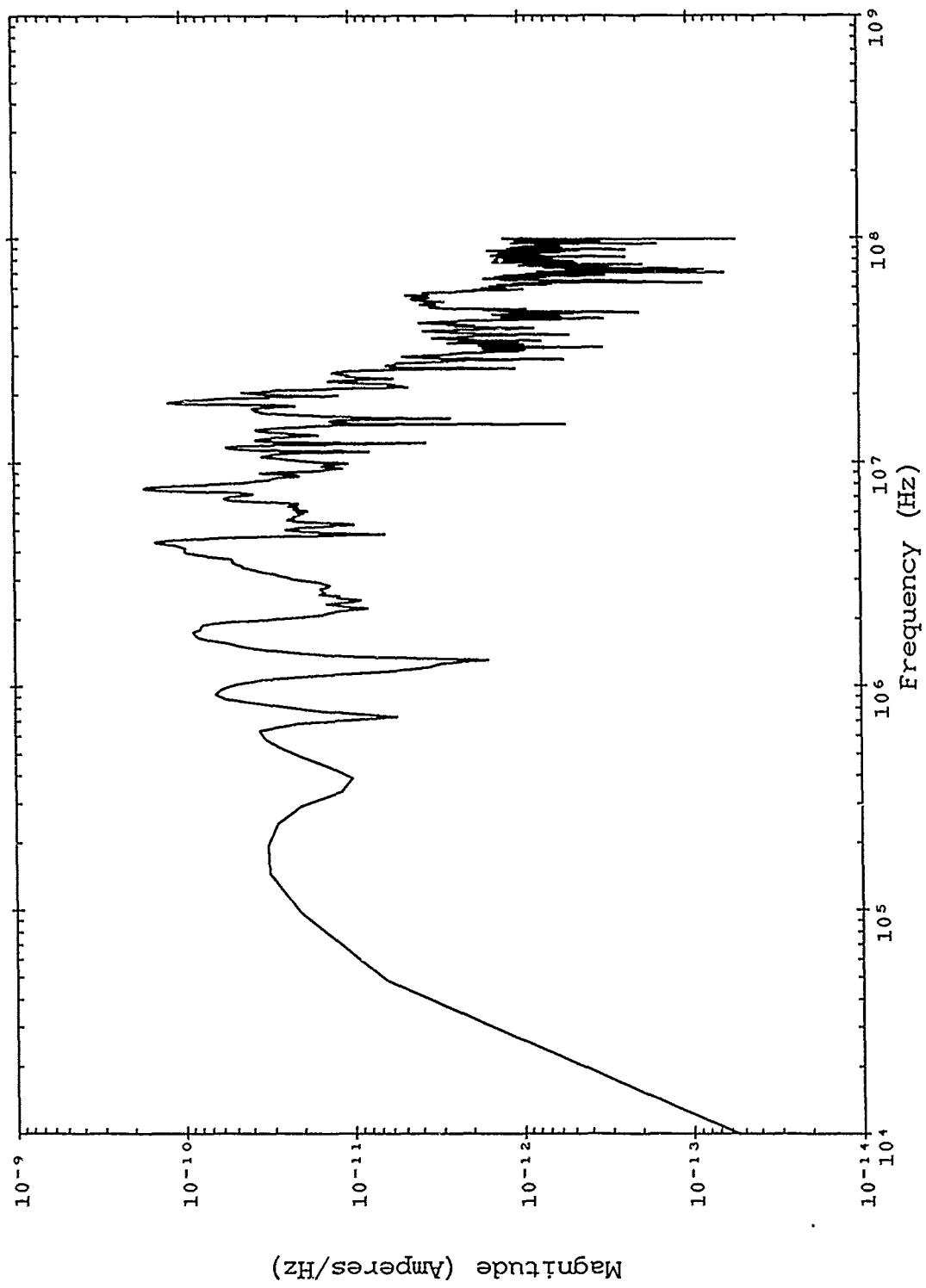


Figure B-7. Corrected TRESTLE data; TP 0141 SN 2662.

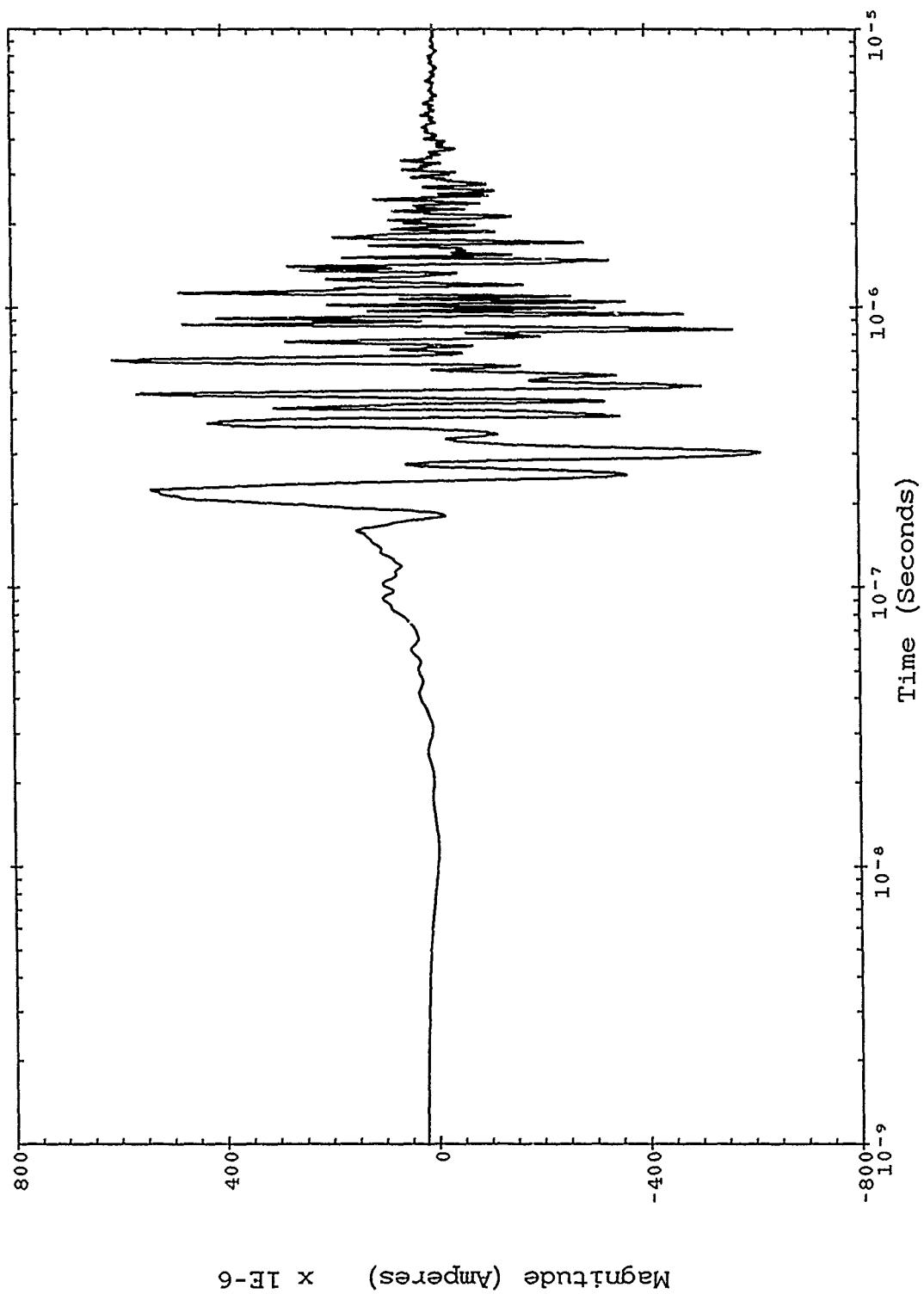


Figure B-8. Corrected TRESTLE data; TP 0141 SN 2662.

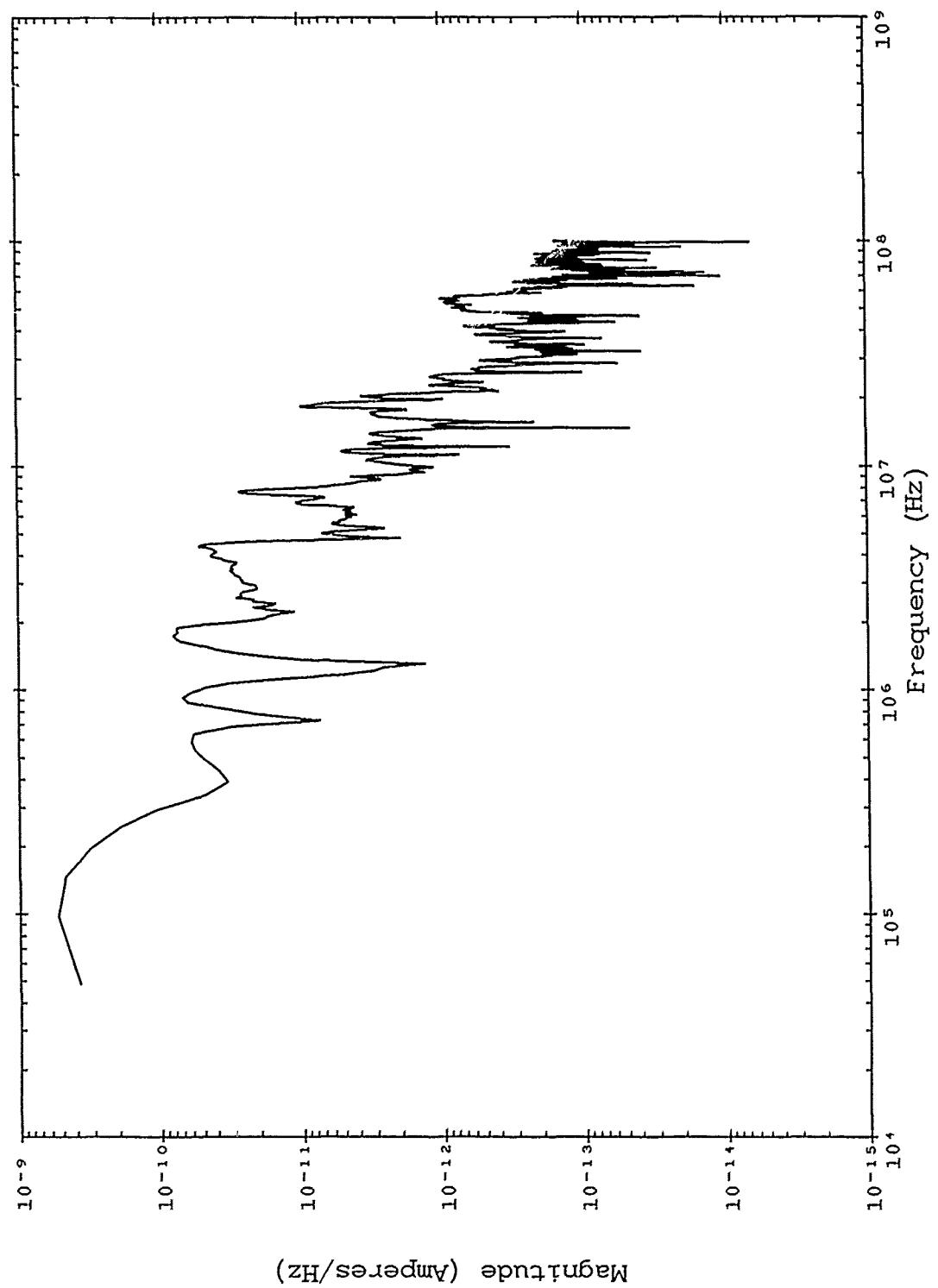


Figure B-9. Severe nearby lightning threat; TP 0141 SN 2662.

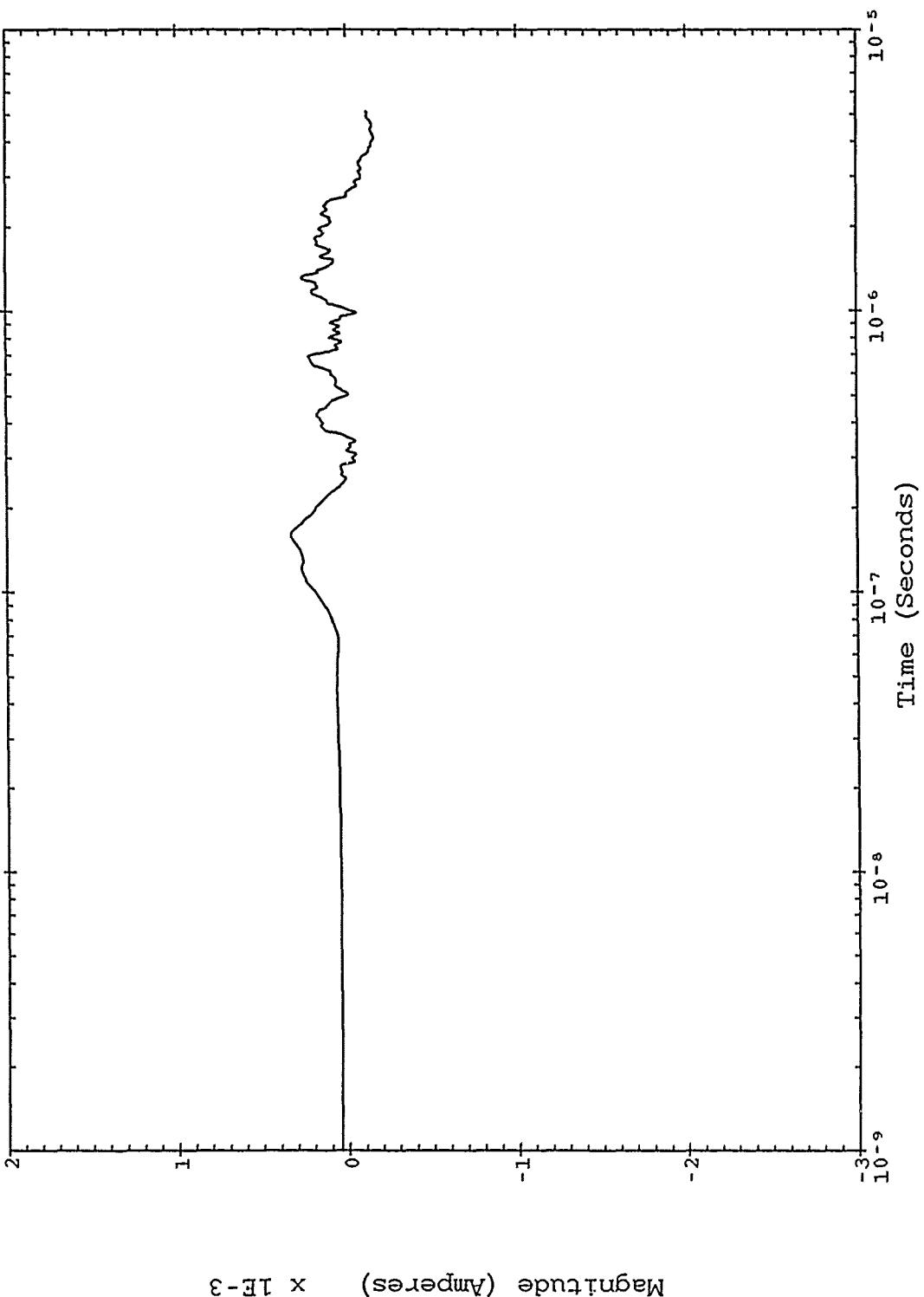


Figure B-10. Severe nearby lightning threat; TP 0141 SN 2662.

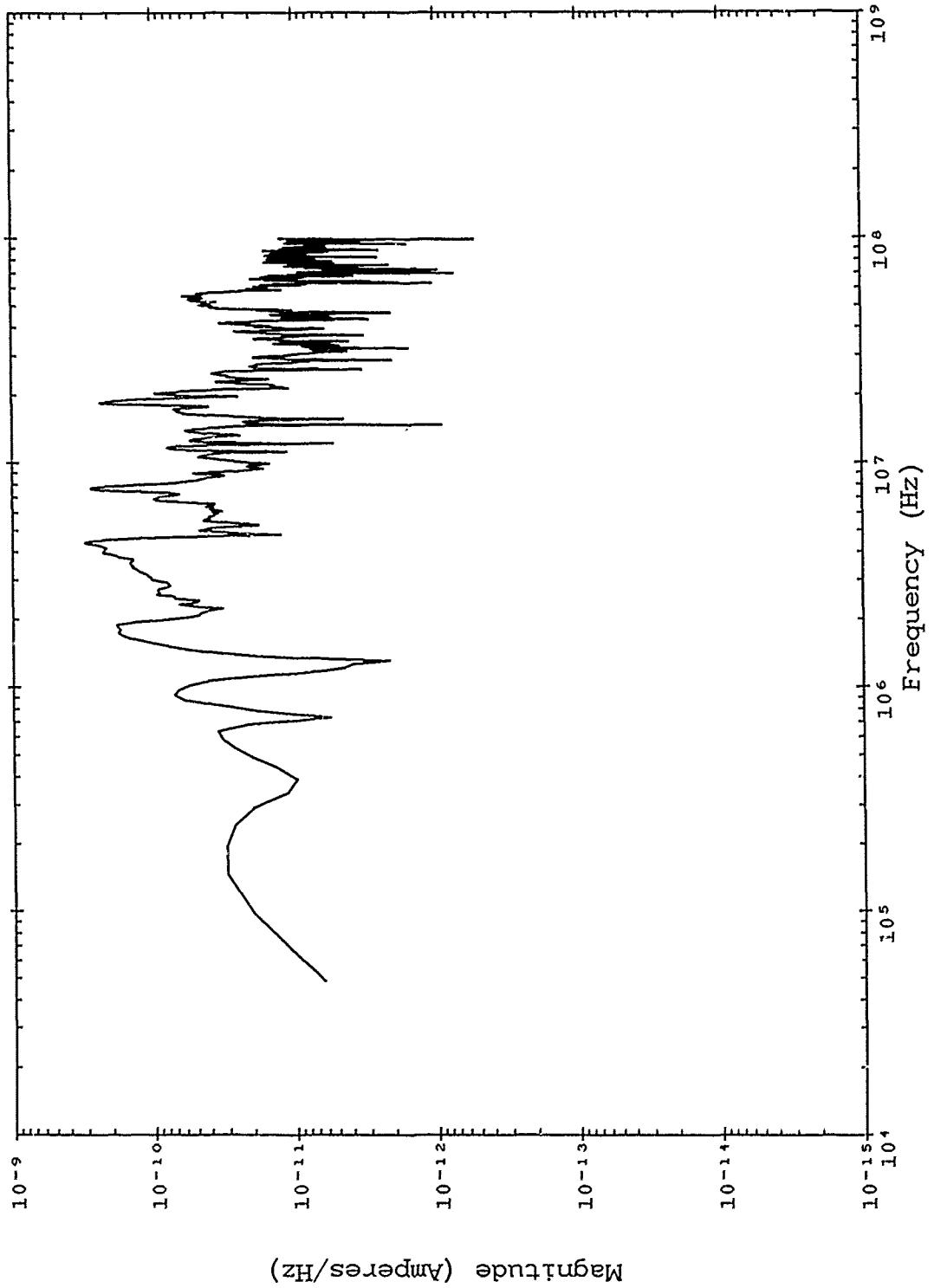


Figure B-11. Double exponential threat; TP 0141 SN 2662.

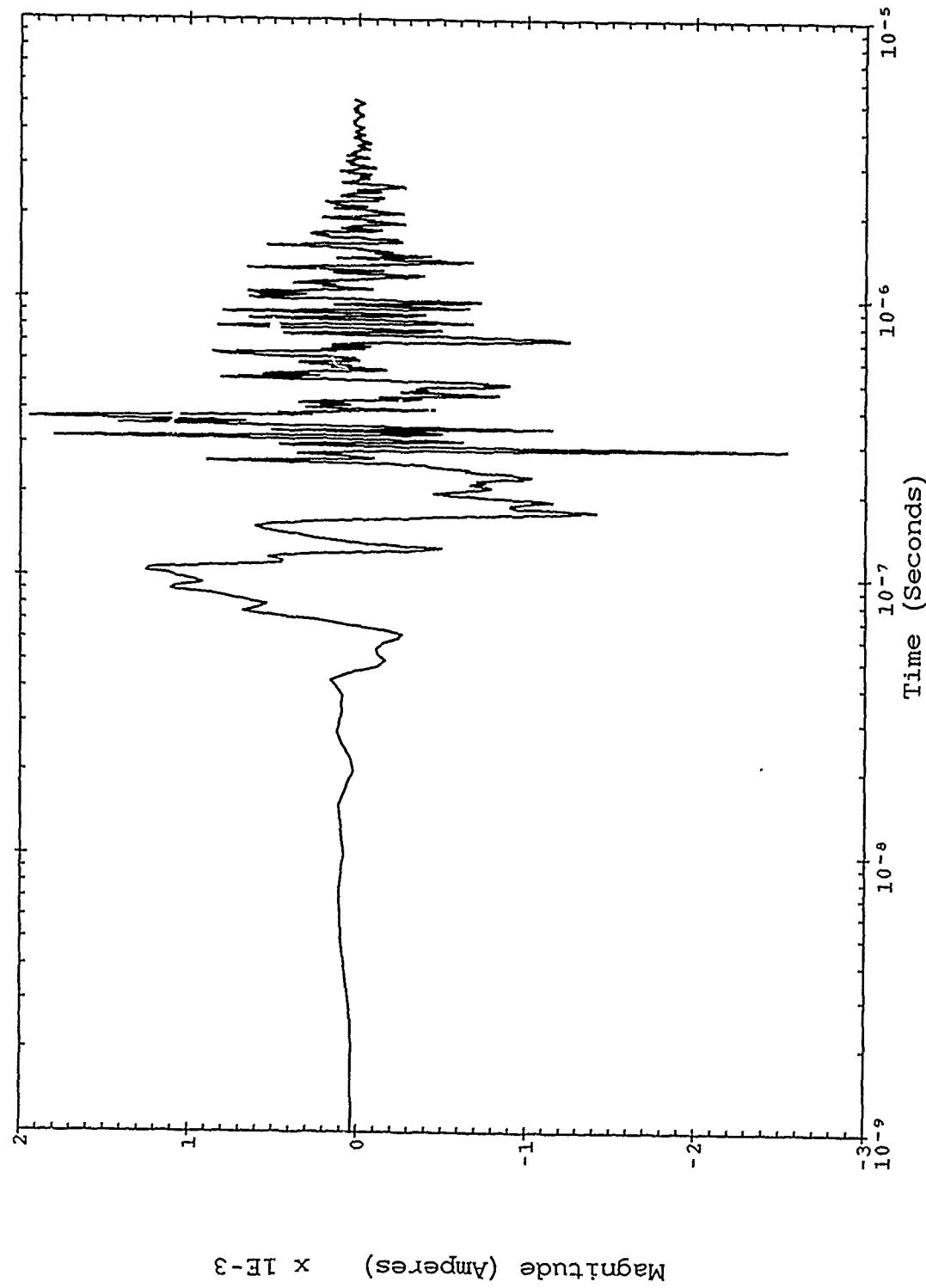


Figure B-12. Double exponential threat; TP 0141 SN 2662.

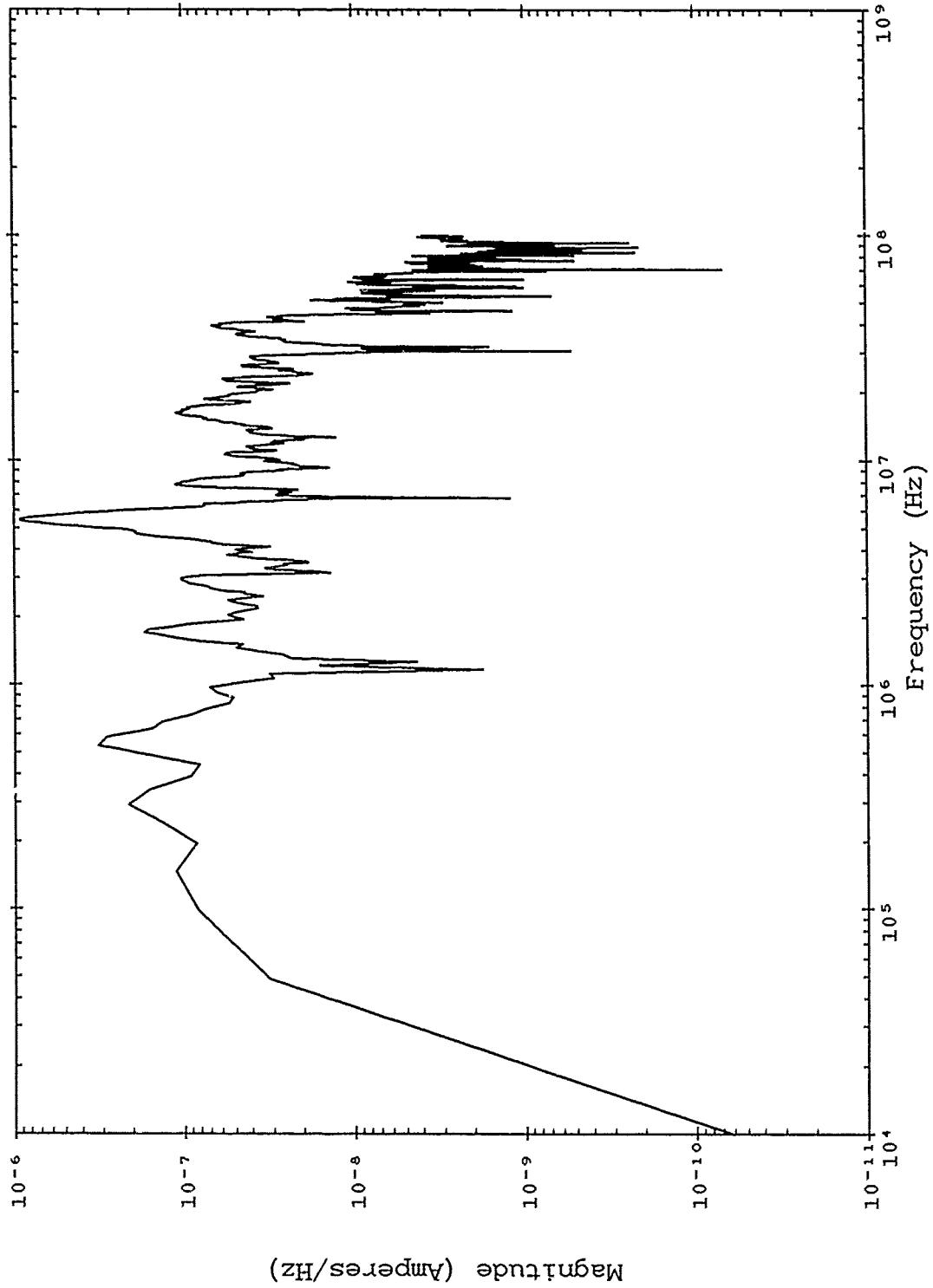


Figure B-13. Corrected TRESTLE data; TP 0434 SN 2502.

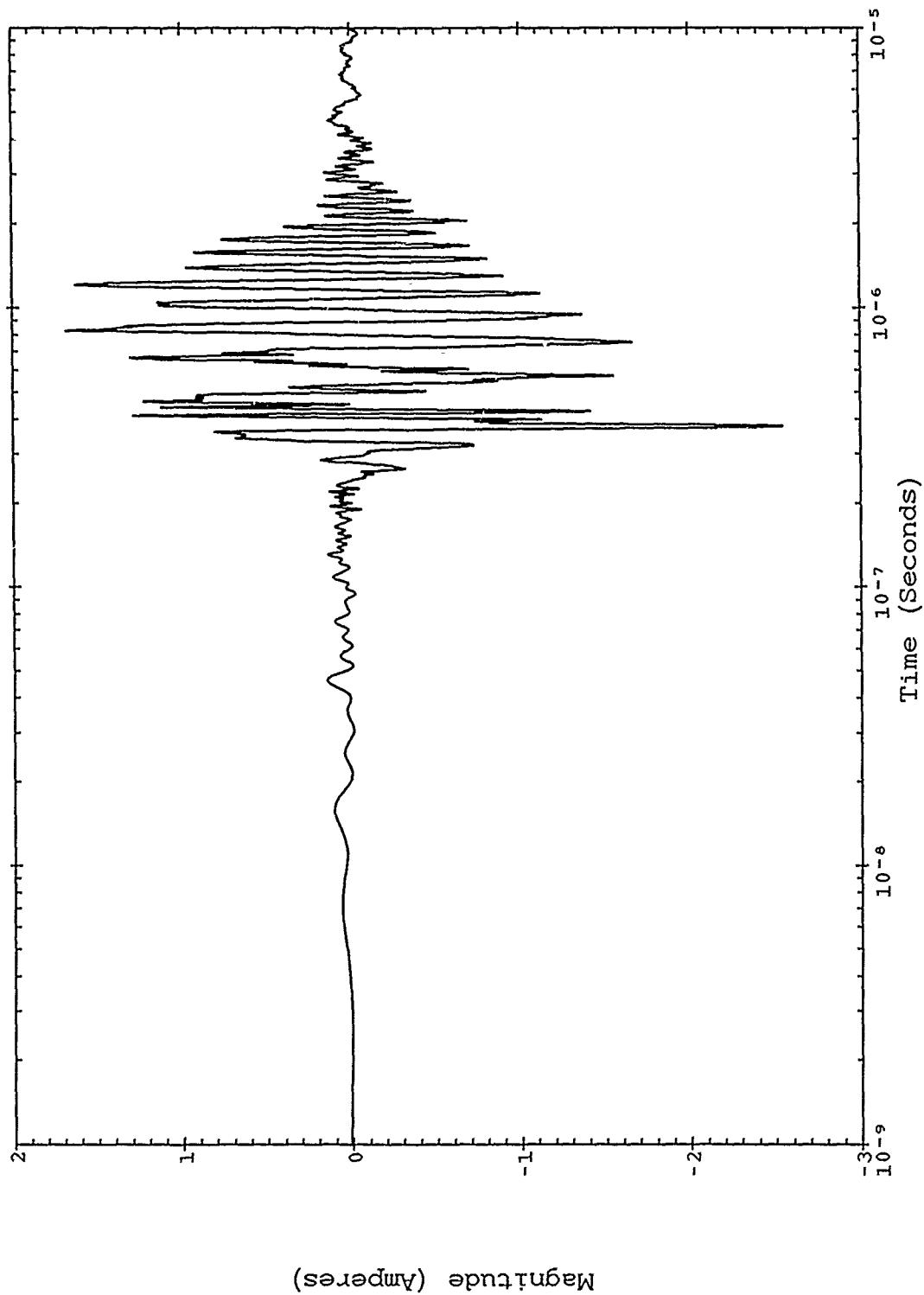


Figure B-14. Corrected TRESTLE data; TP 0434 SN 2502.

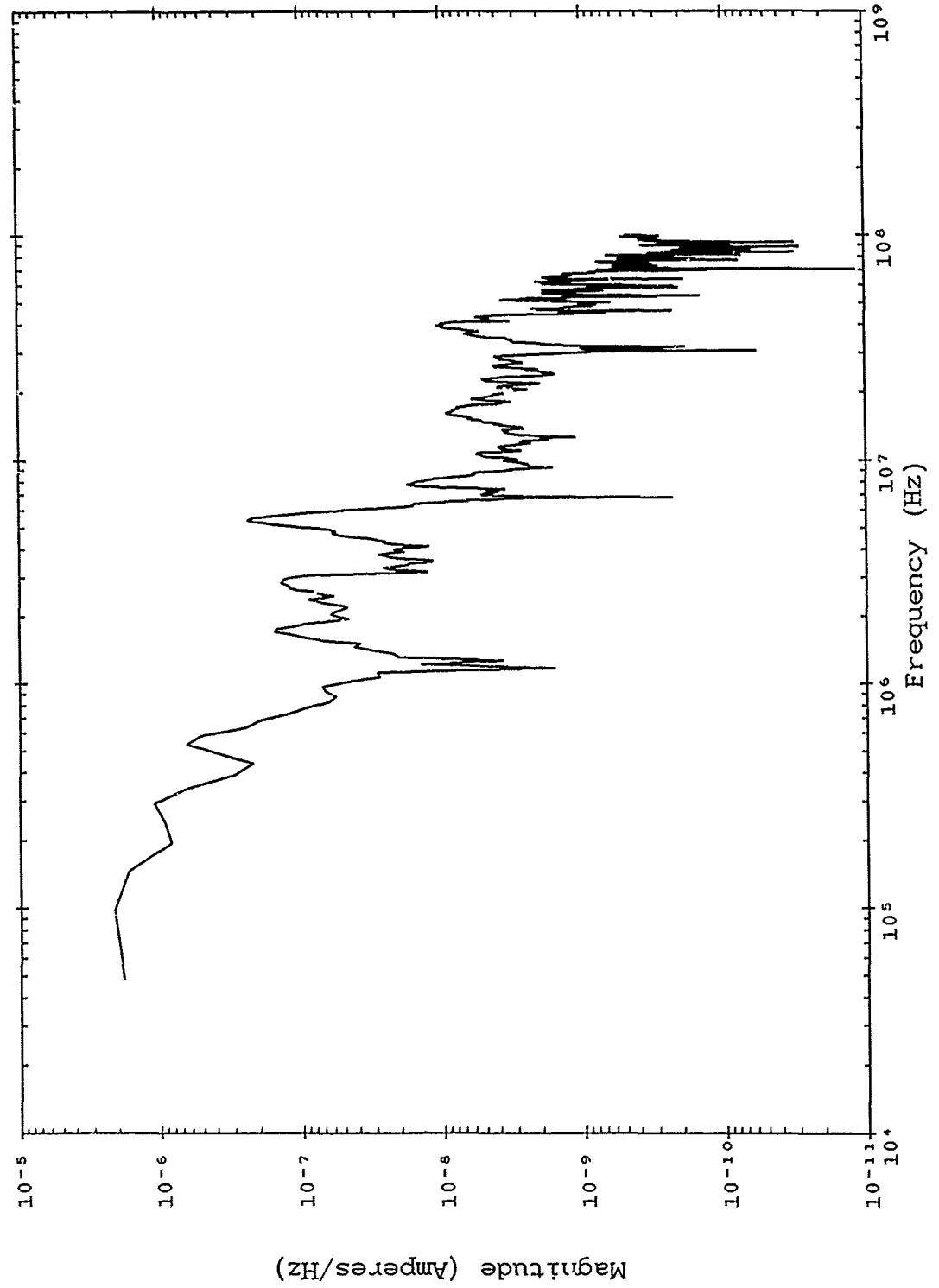


Figure B-15. Severe nearby lightning threat; TP 0434 SN 2502.

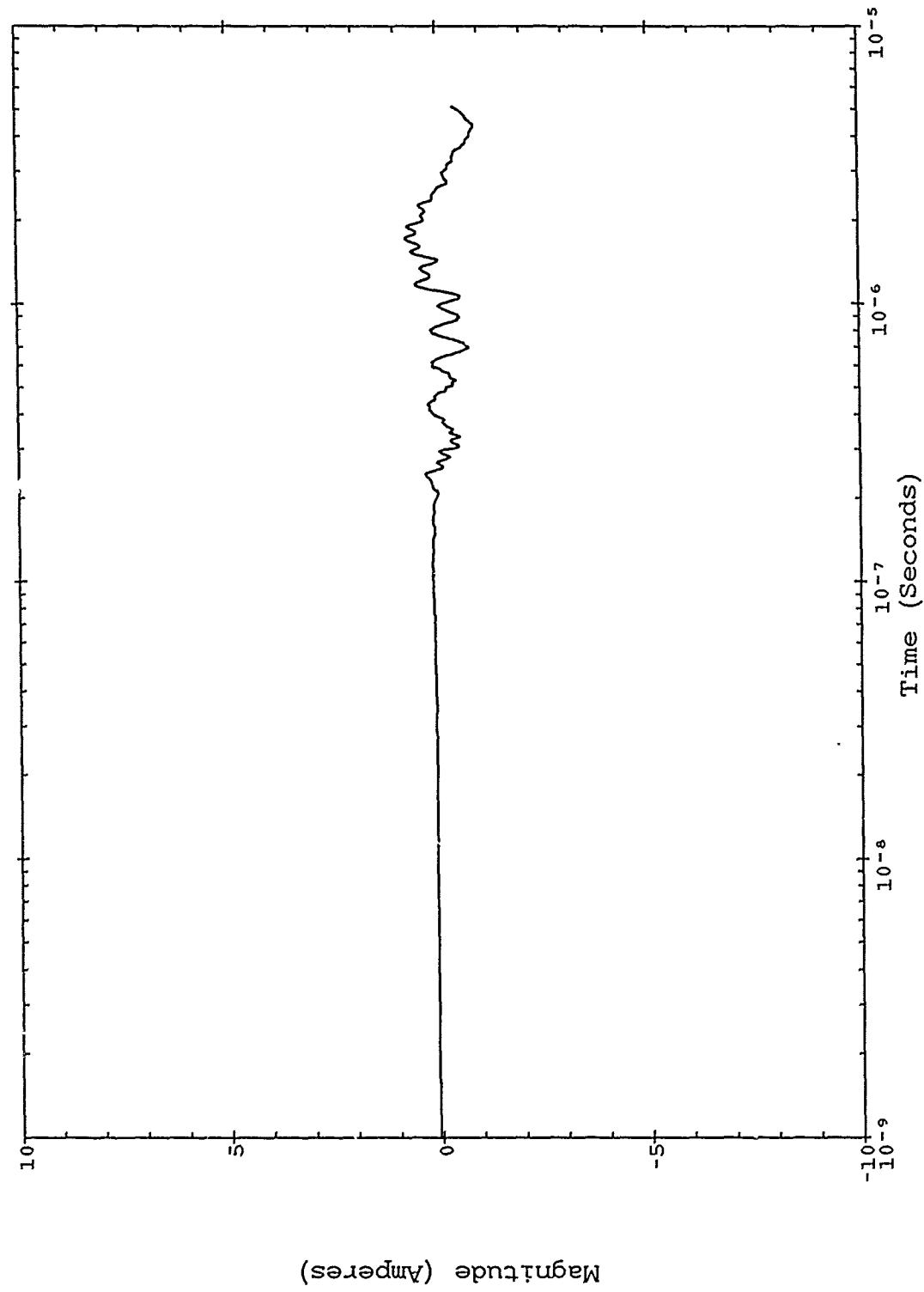


Figure B-16. Severe nearby lightning threat; TP 0434 SN 2502.

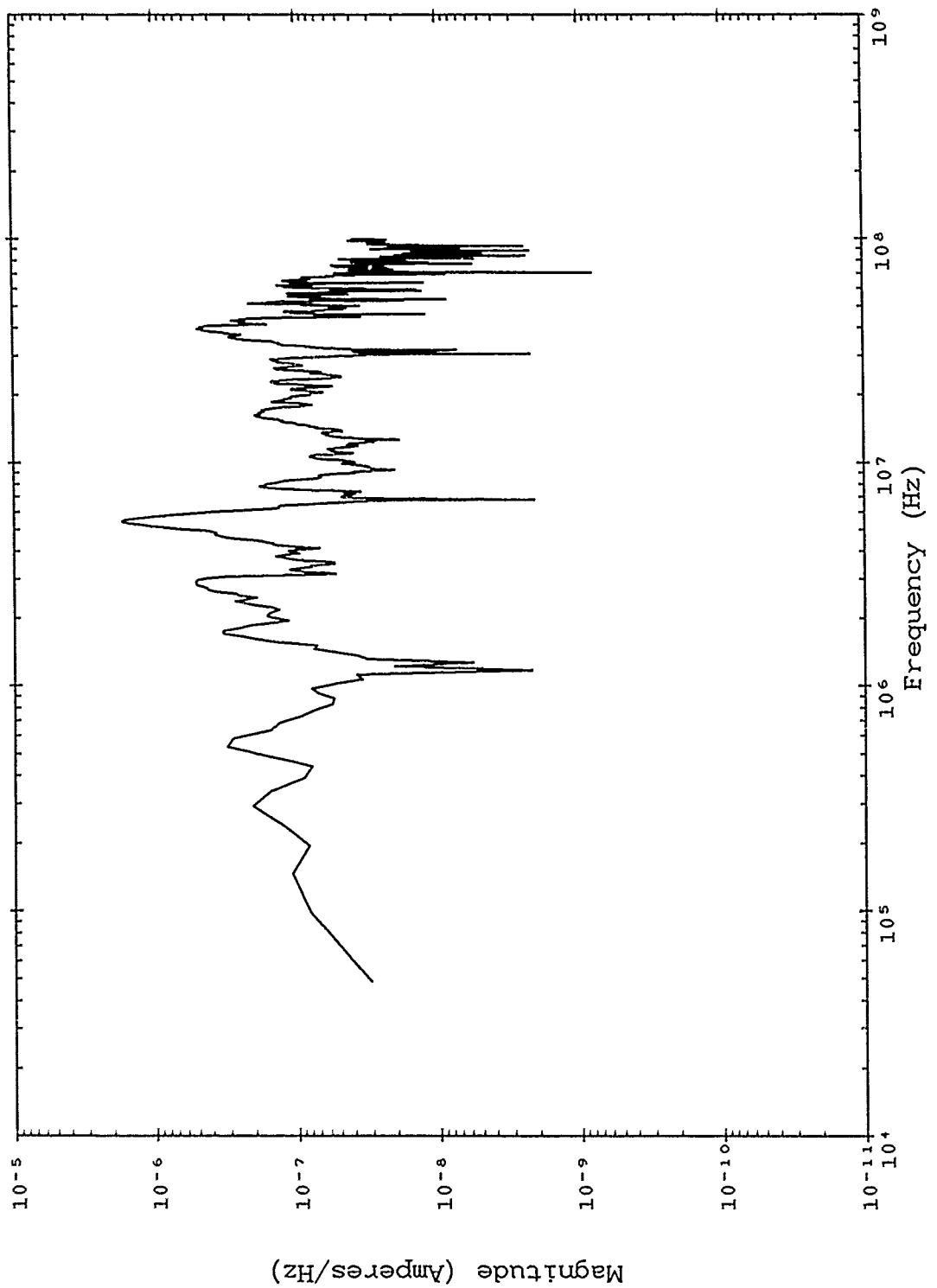


Figure B-17. Double exponential threat; TP 0434 SN 2502.

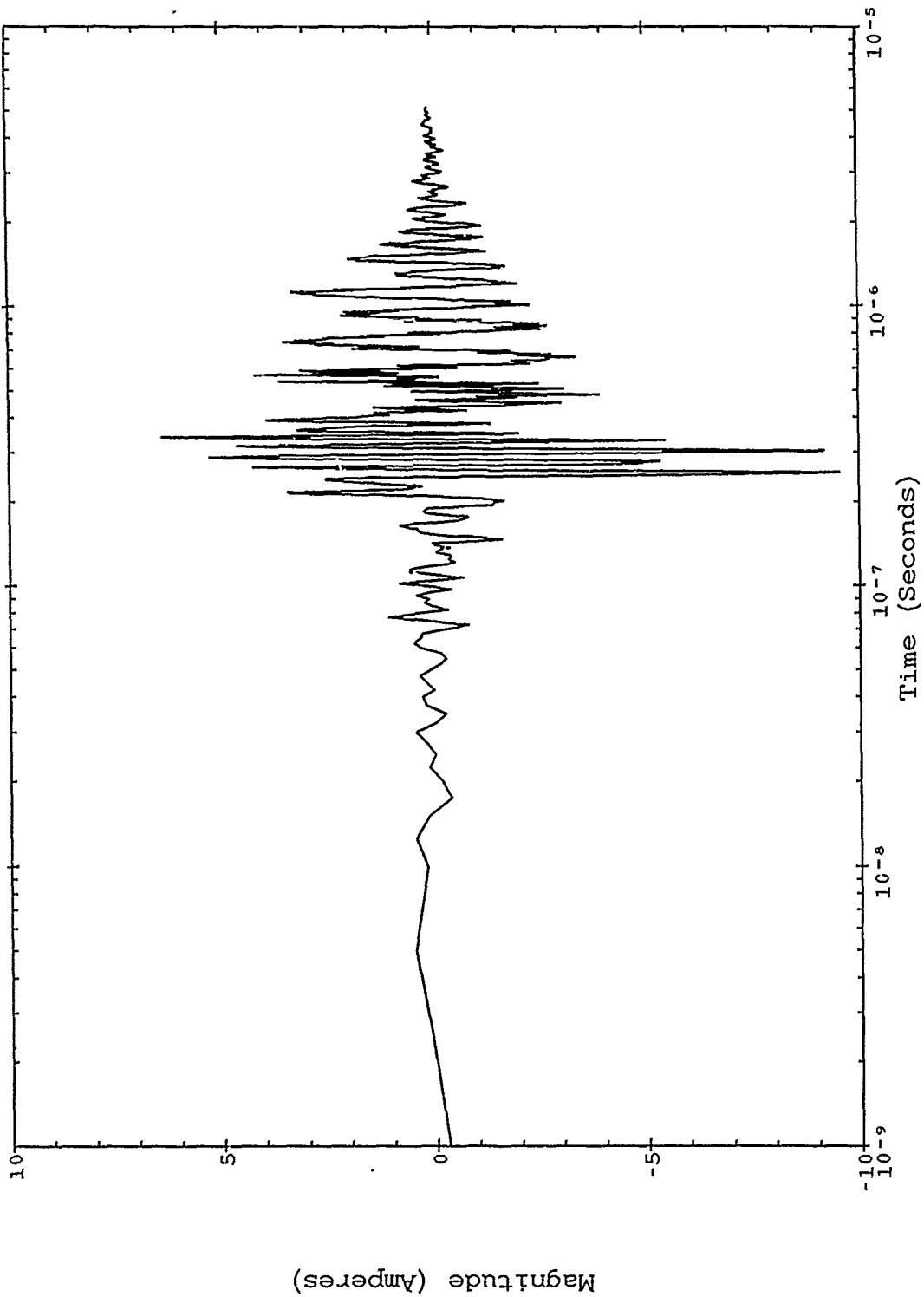


Figure B-18. Double exponential threat; TP 0434 SN 2502.

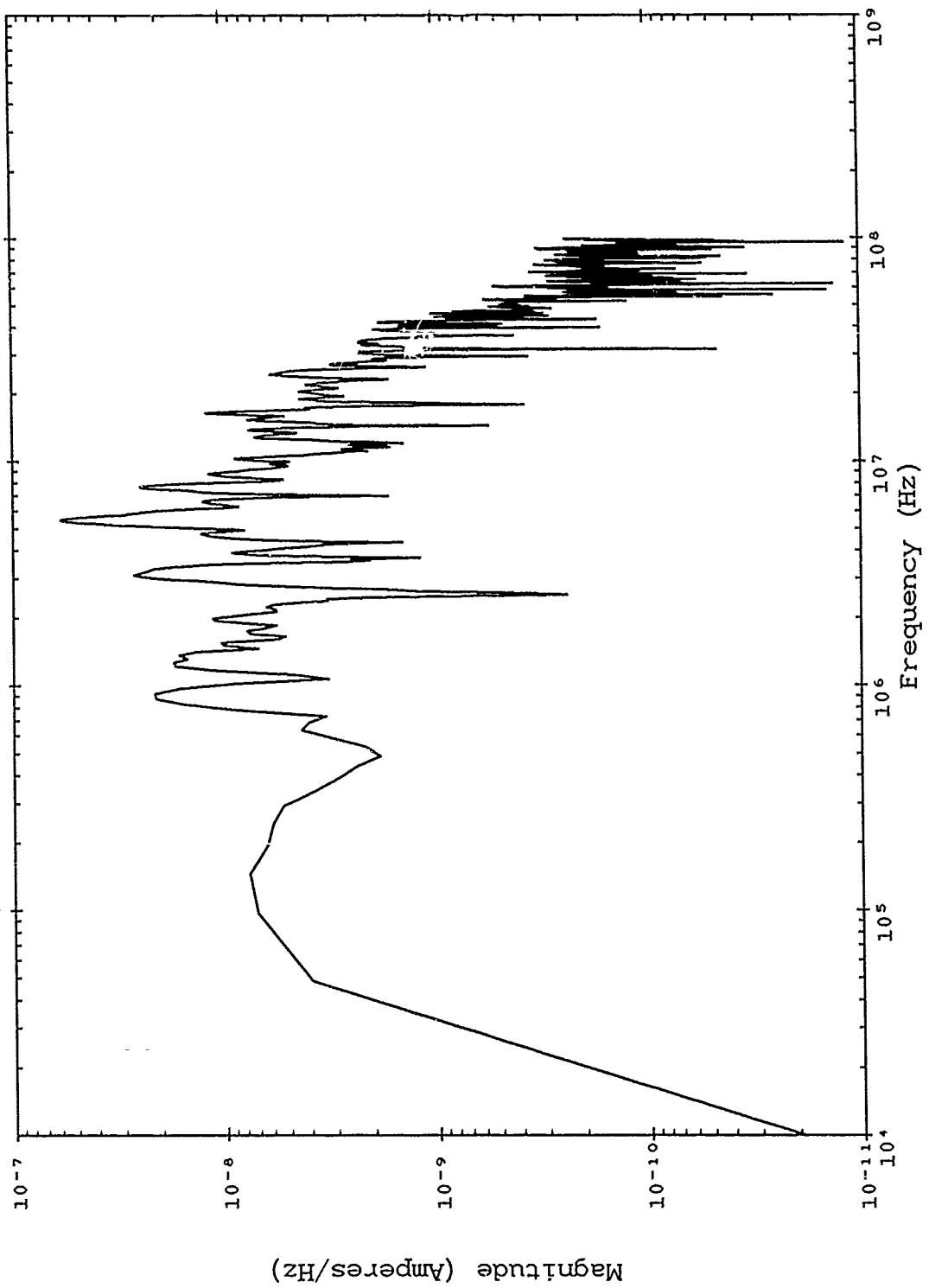


Figure B-19. Corrected TRESTLE data; TP 0504 SN 1680.

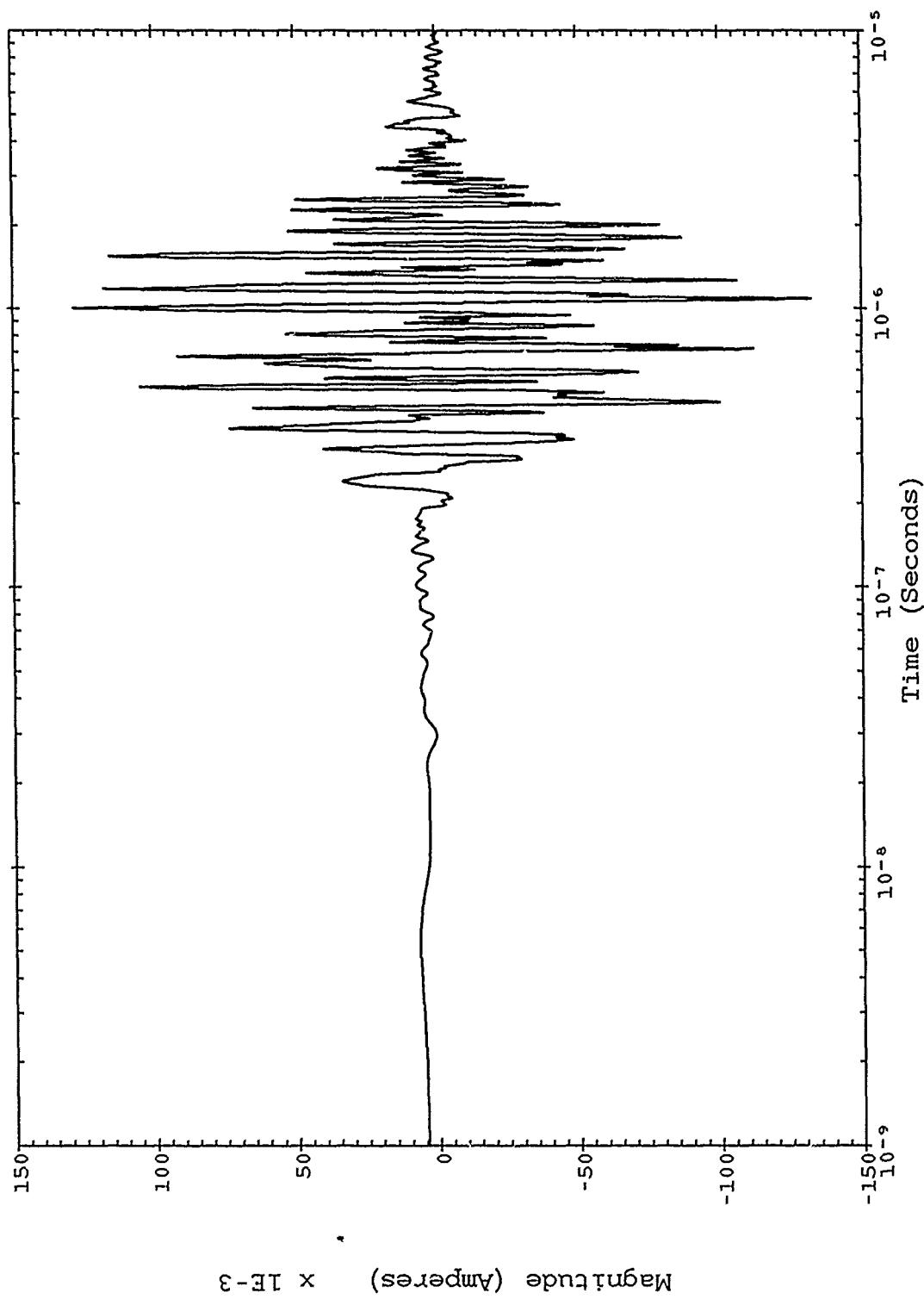


Figure B-20. Corrected TRESTLE data; TP 0504 SN 1680.

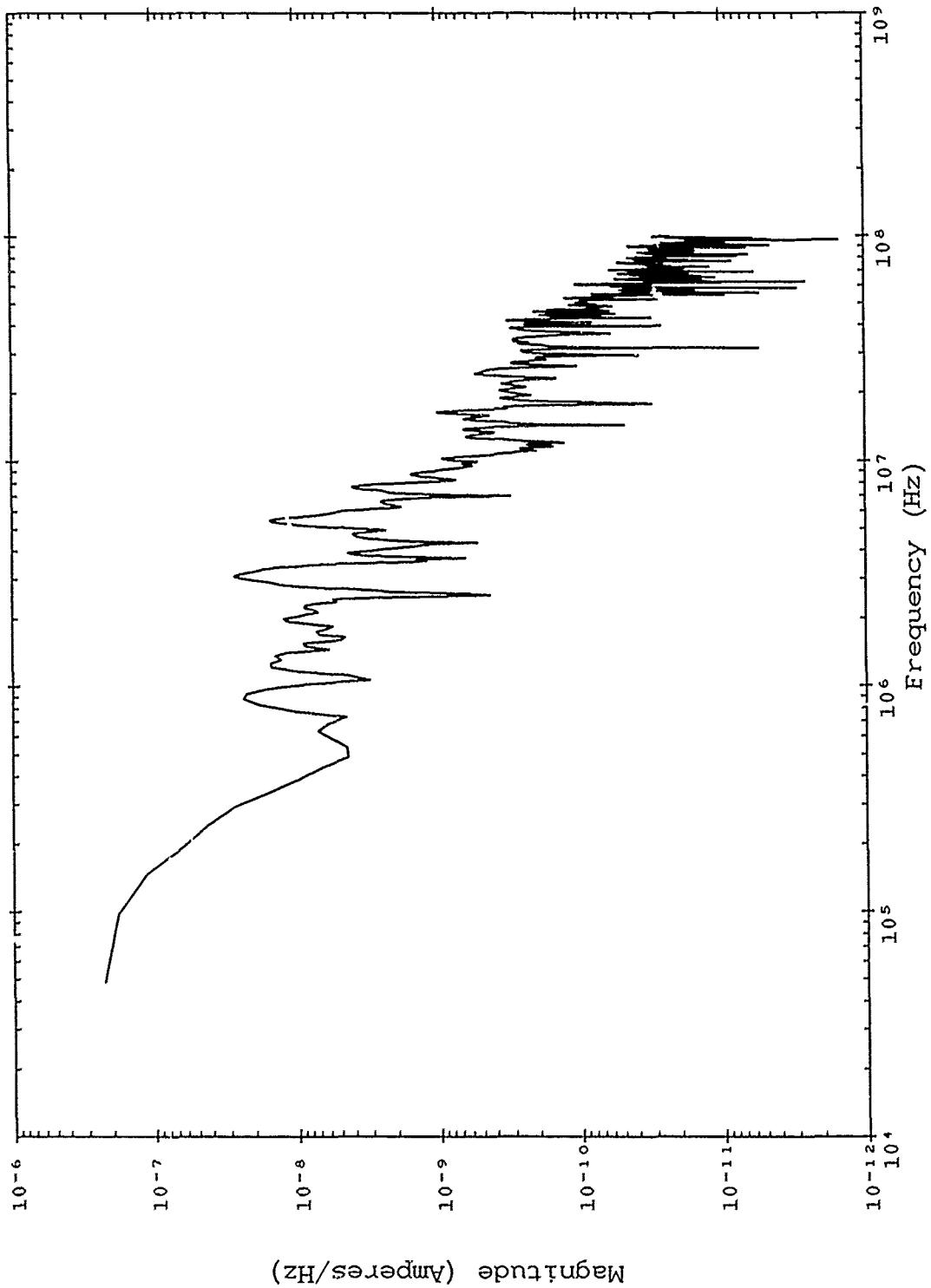


Figure B-21. Severe nearby lightning threat; TP 0504 SN 1680.

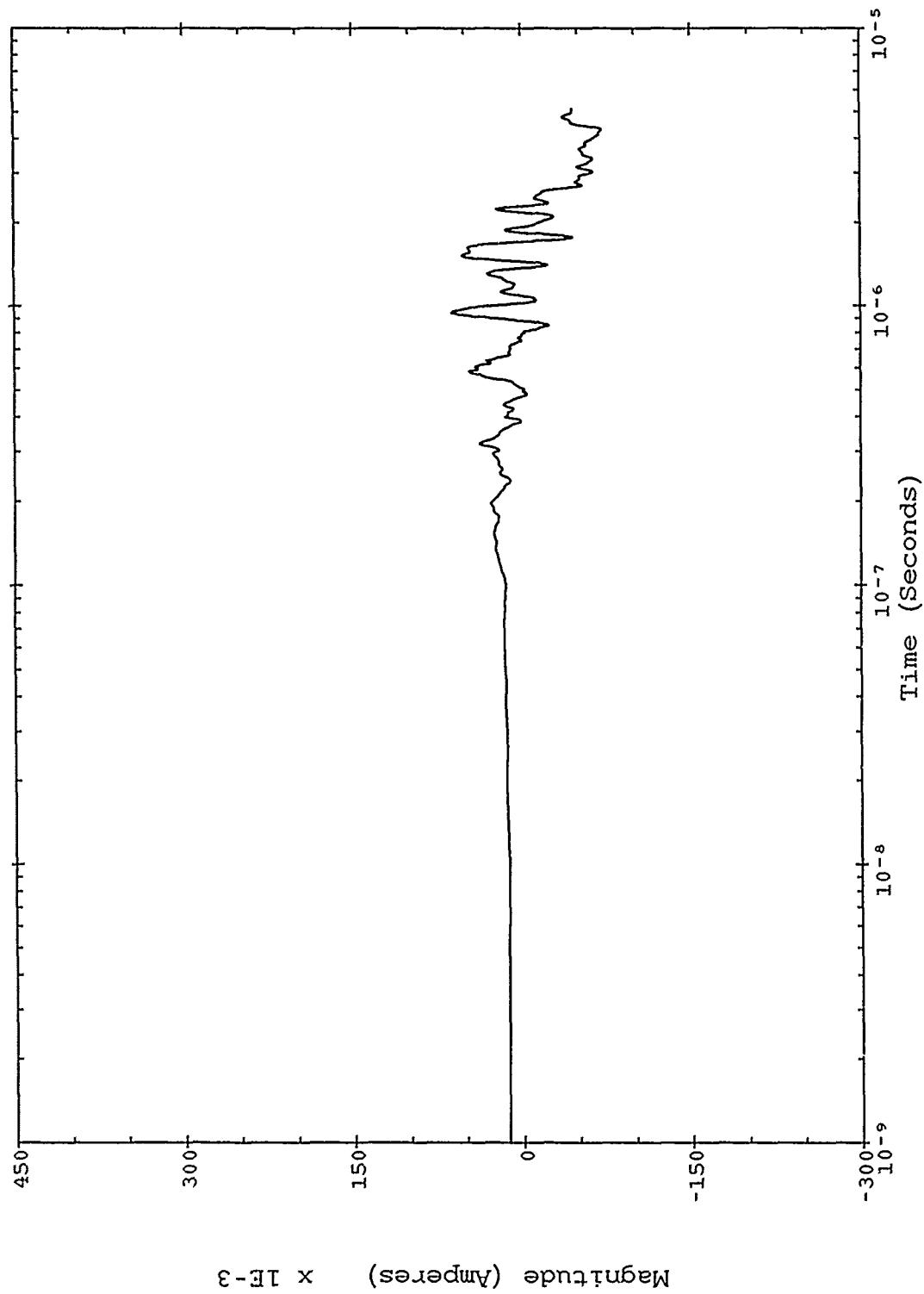


Figure B-22. Severe nearby lightning threat; TP 0504 SN 1680.

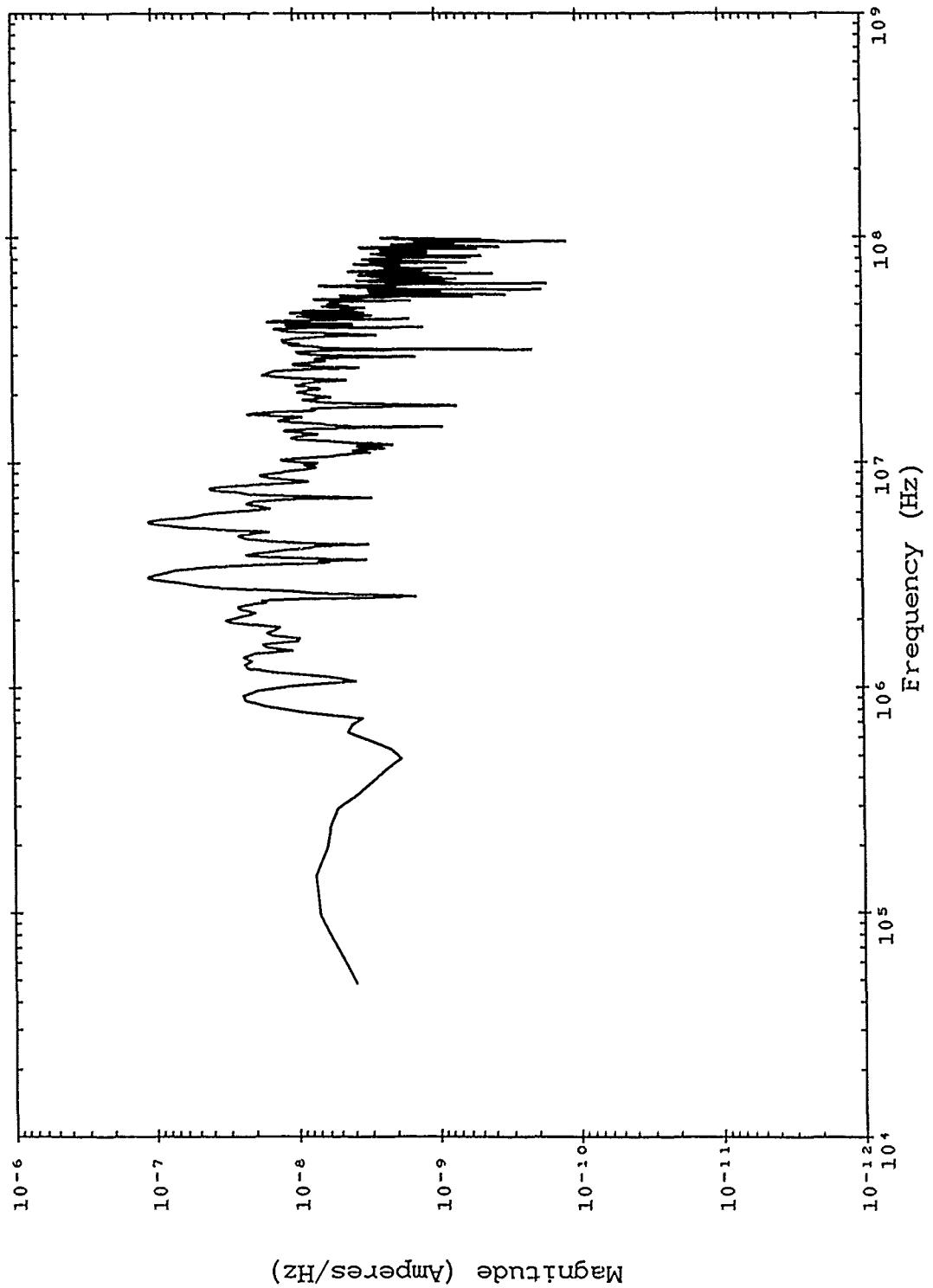


Figure B-23. Double exponential threat; TP 0504 SN 1680.

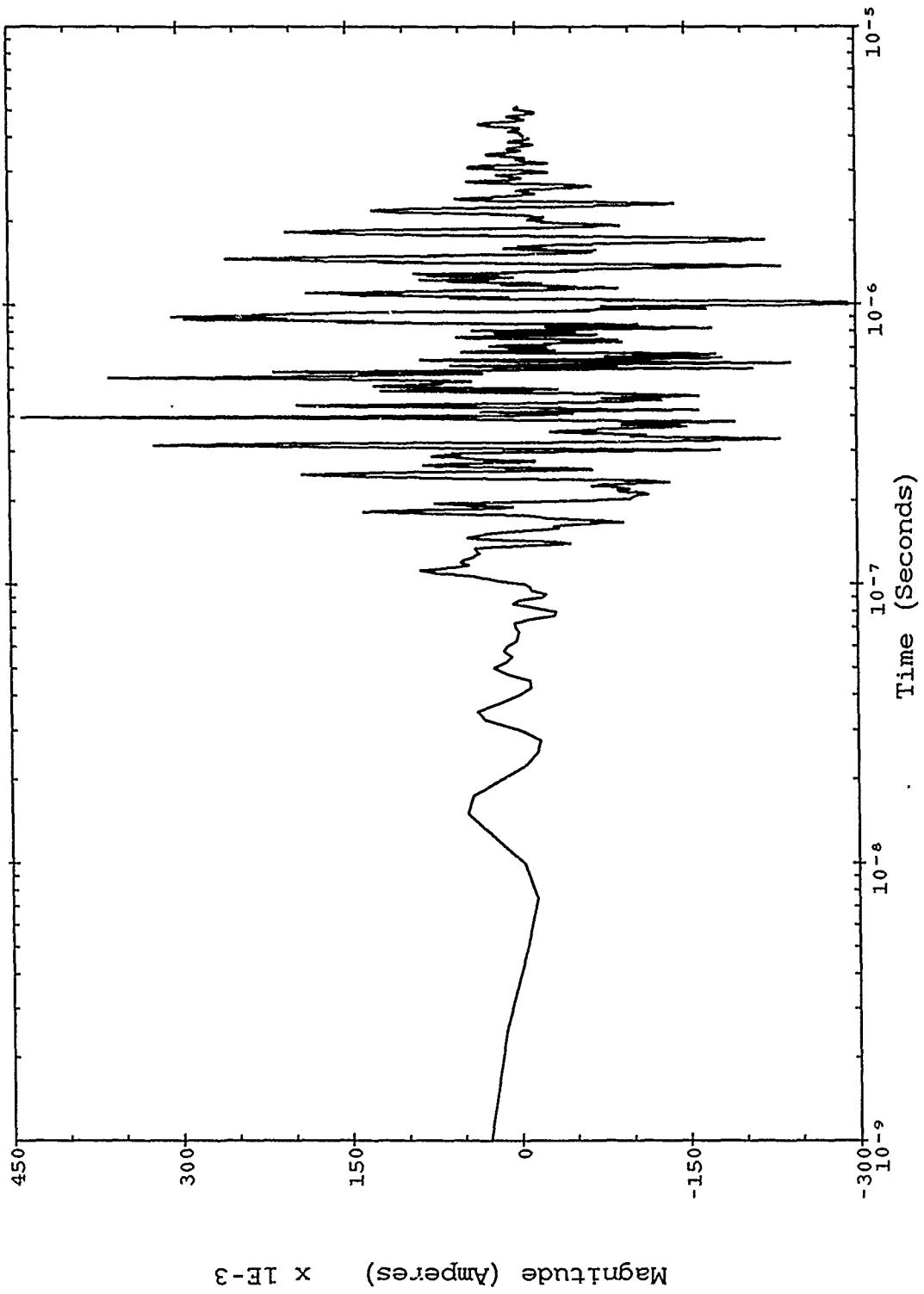


Figure B-24. Double exponential threat; TP 0504 SN 1680.

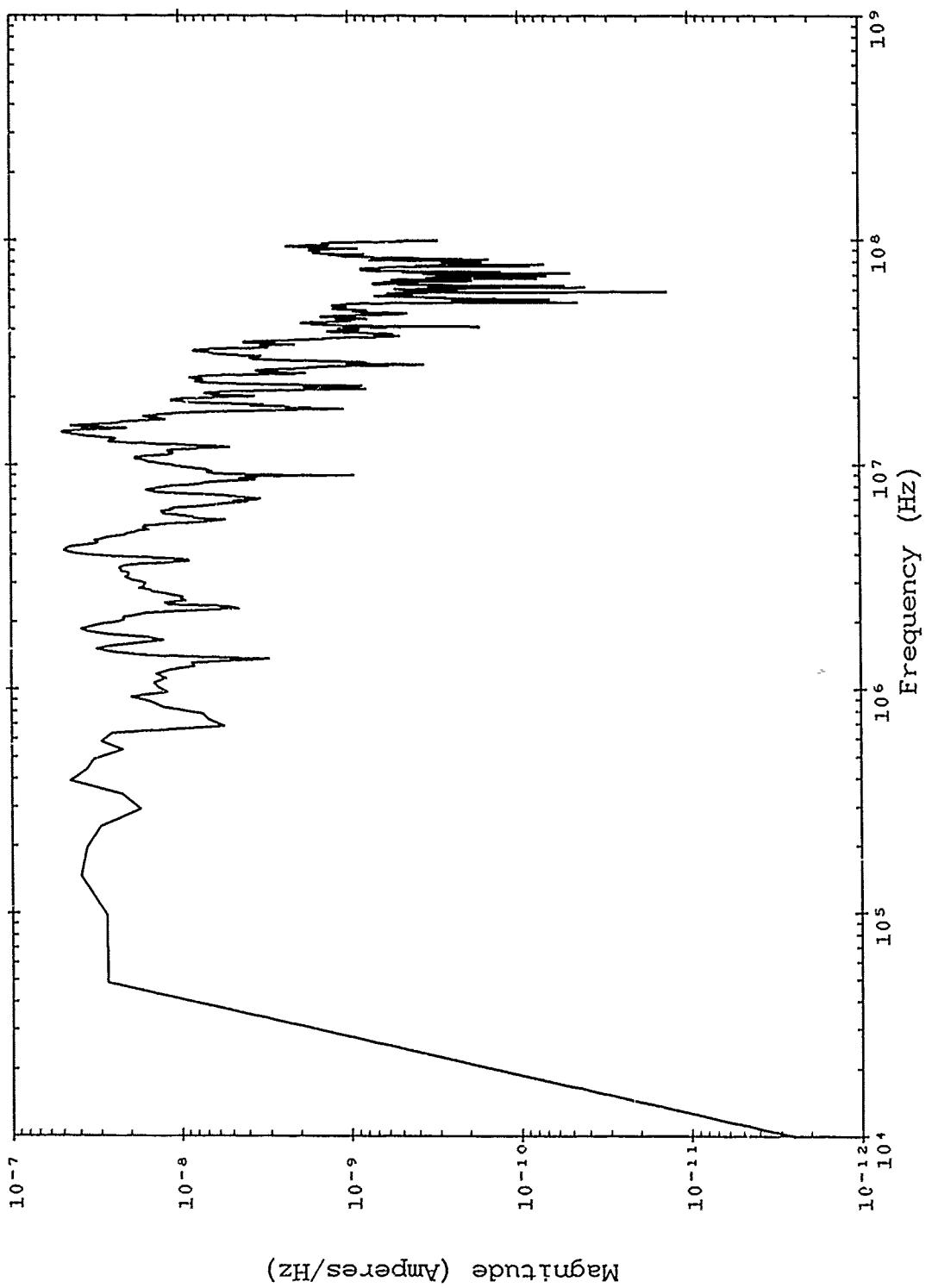


Figure B-25. Corrected TRESTLE data; TP 0516 SN 2615.

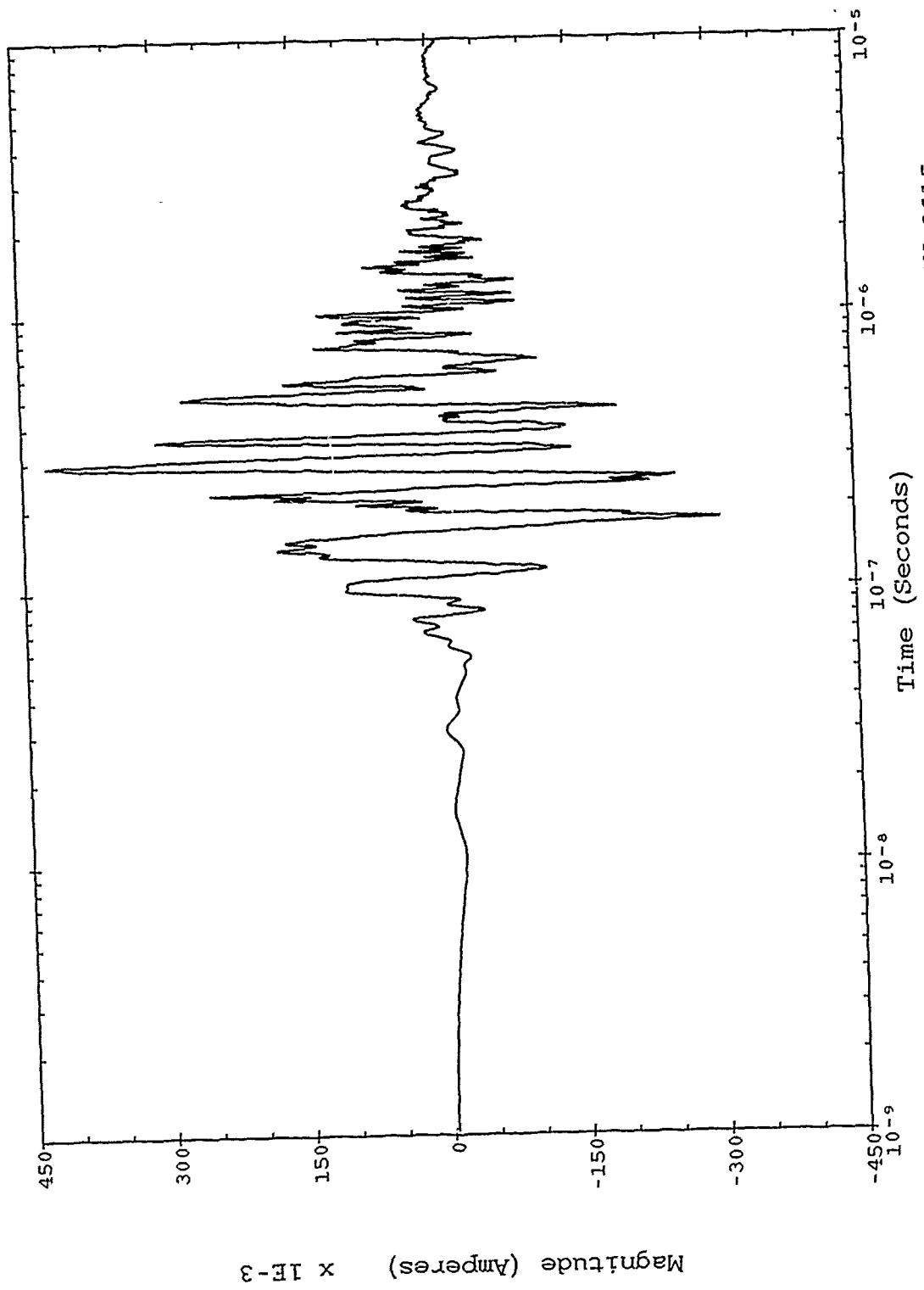


Figure B-26. Corrected TRESTLE data; TP 0516 SN 2615.

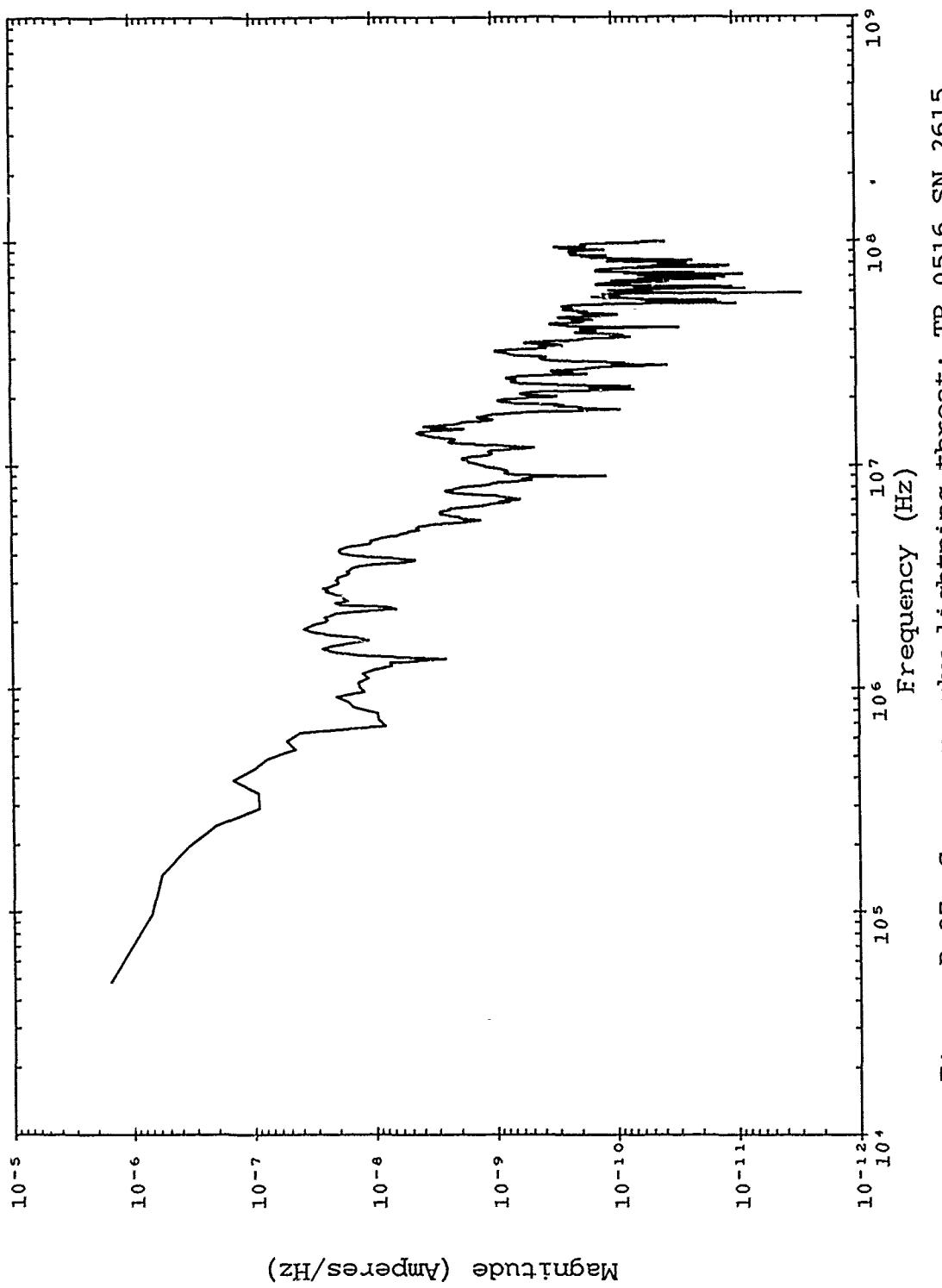


Figure B-27. Severe nearby lightning threat; TP 0516 SN 2615.

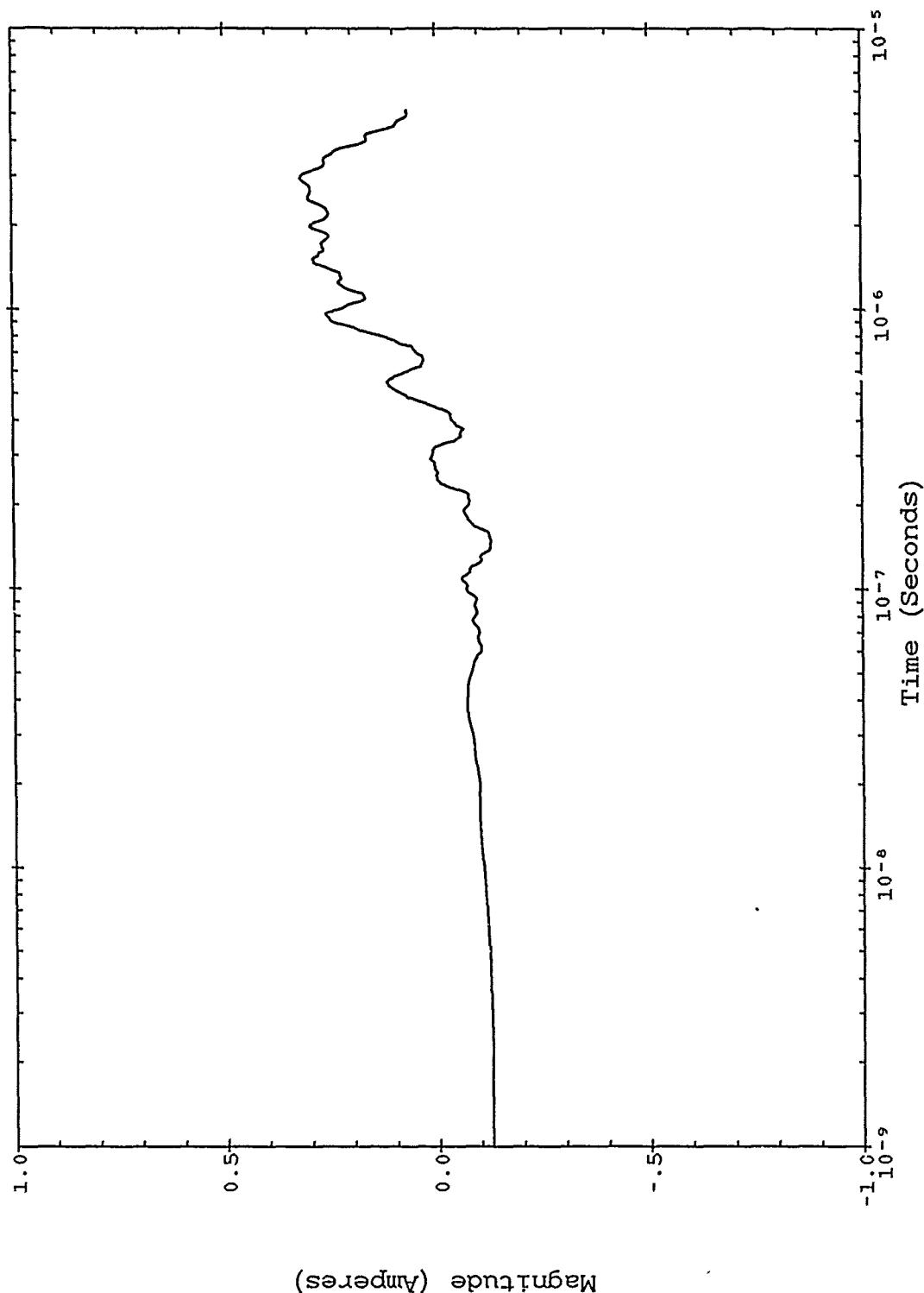


Figure B-28. Severe nearby lightning threat; TP 0516 SN 2615.

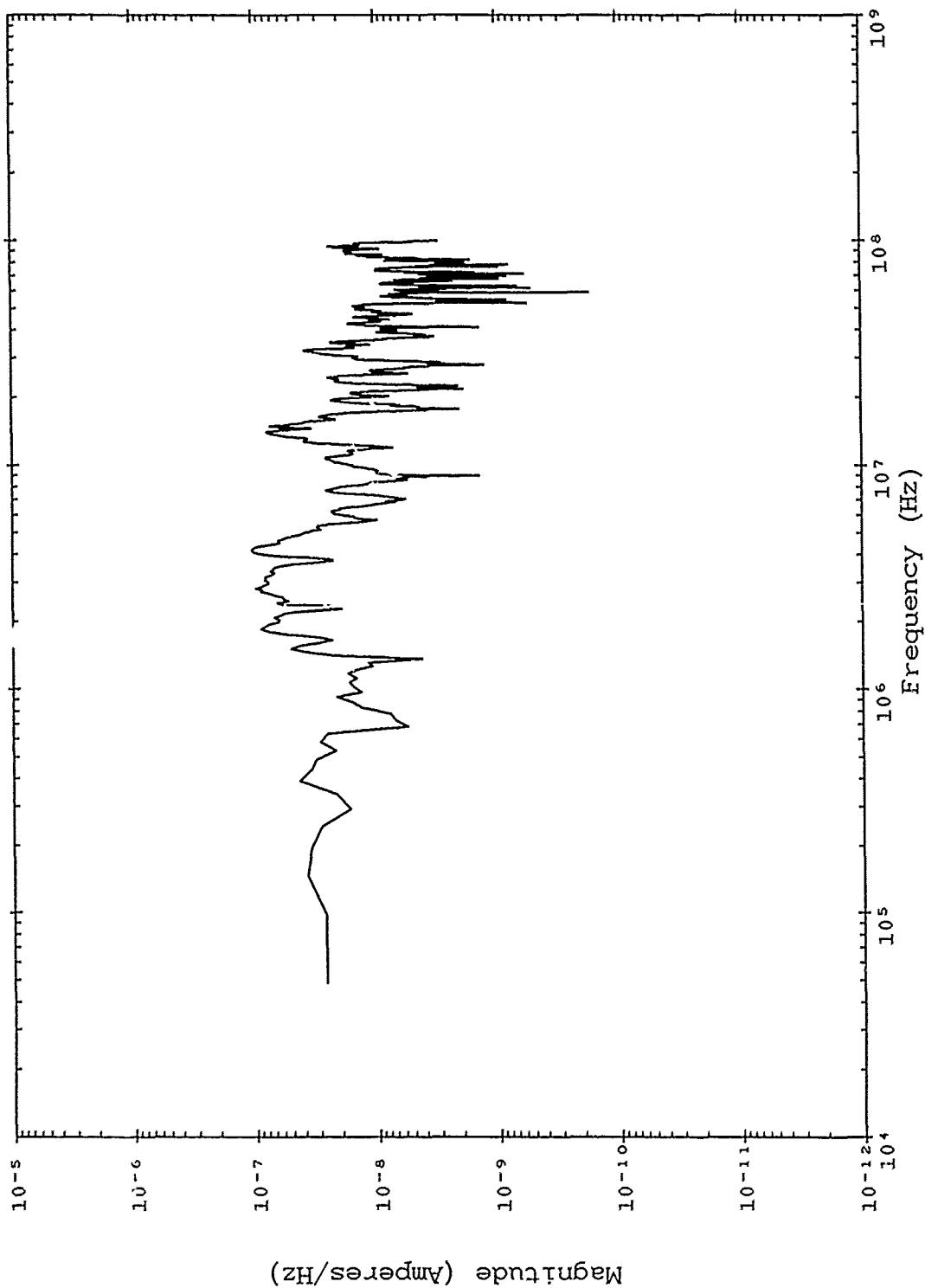


Figure B-29. Double exponential threat; TP 0516 SN 2615.

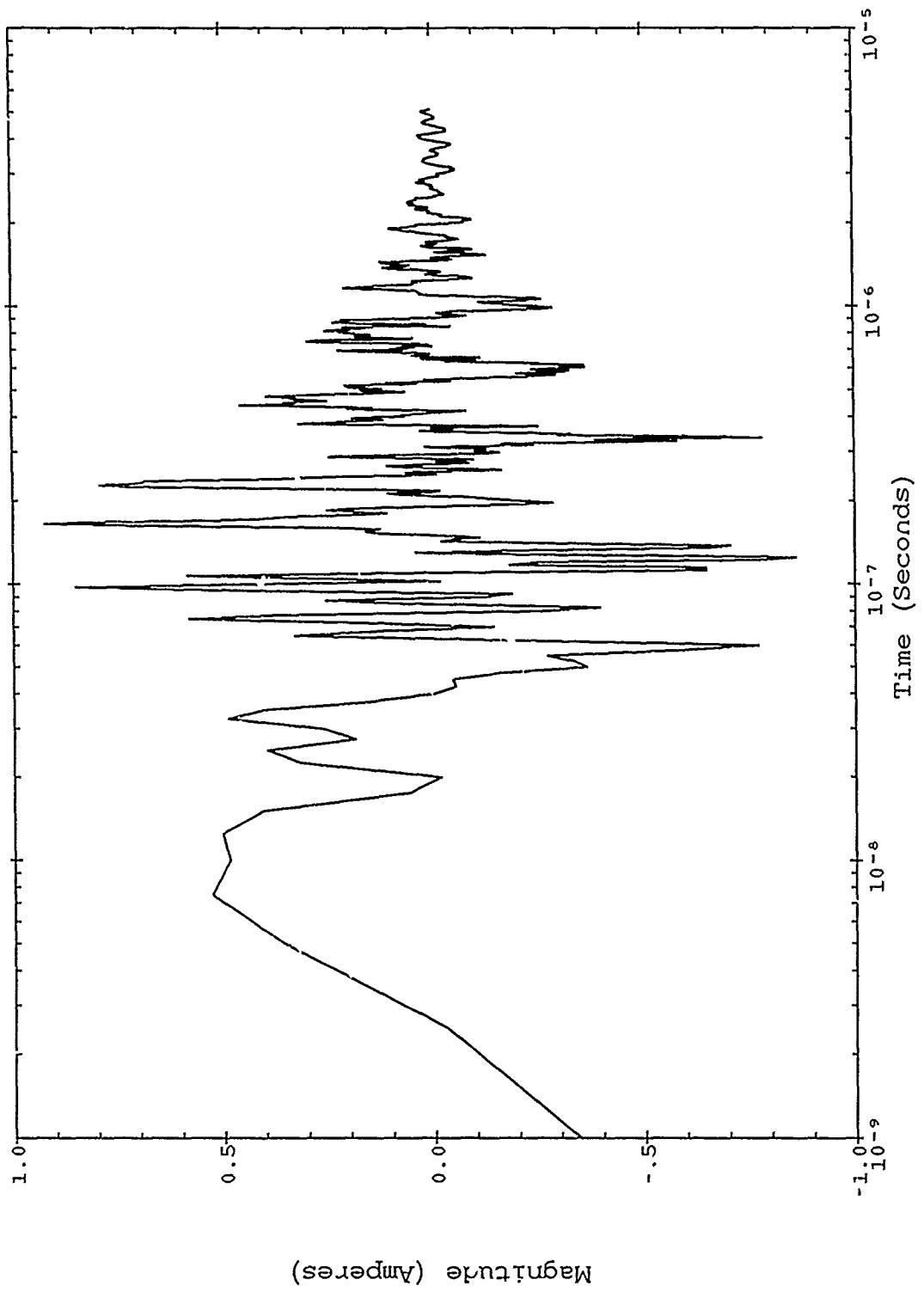


Figure B-30. Double exponential threat; IP 0516 SN 2615.

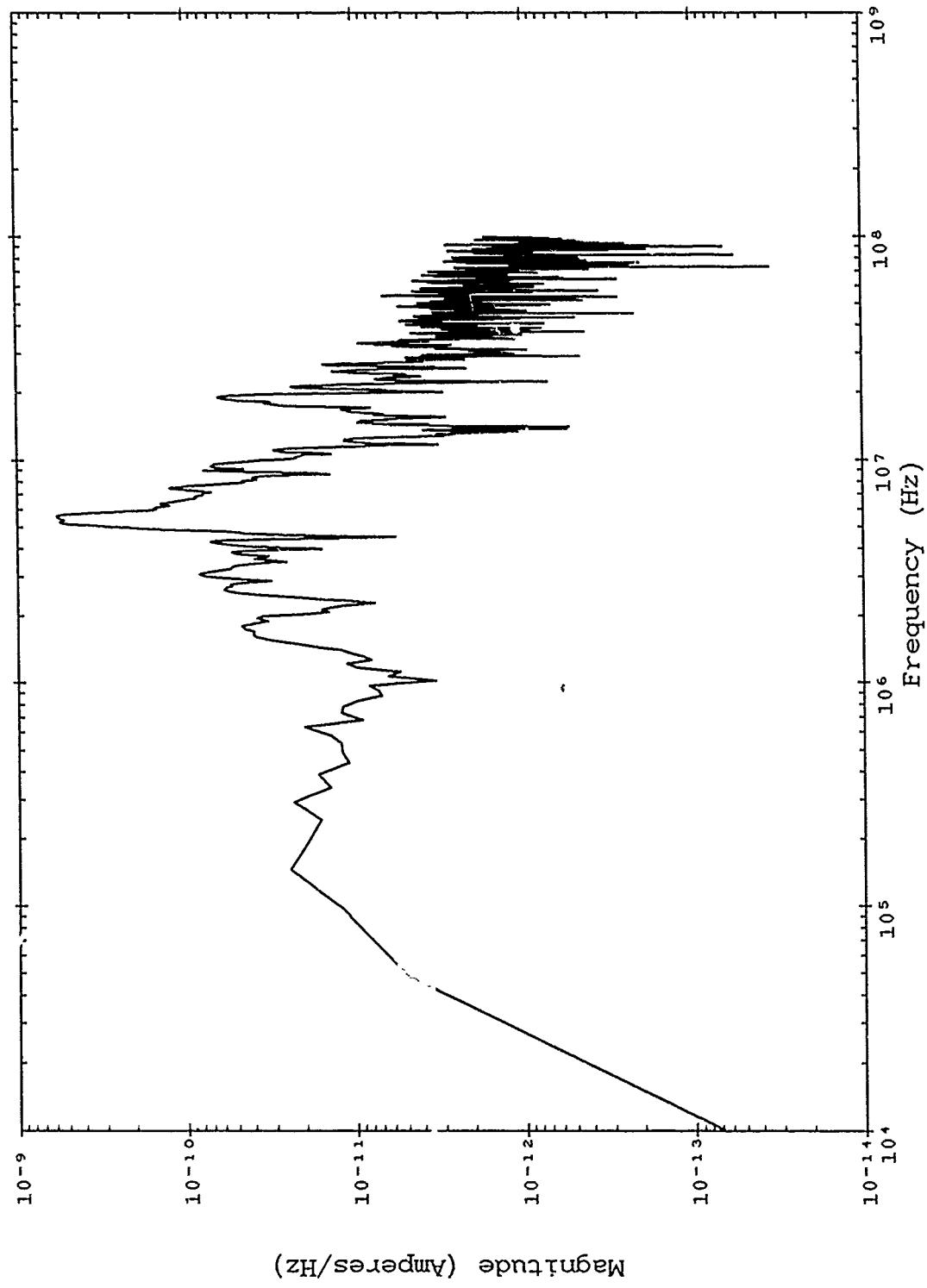


Figure B-31. Corrected TRESTLE data; TP 0594 SN 2584.

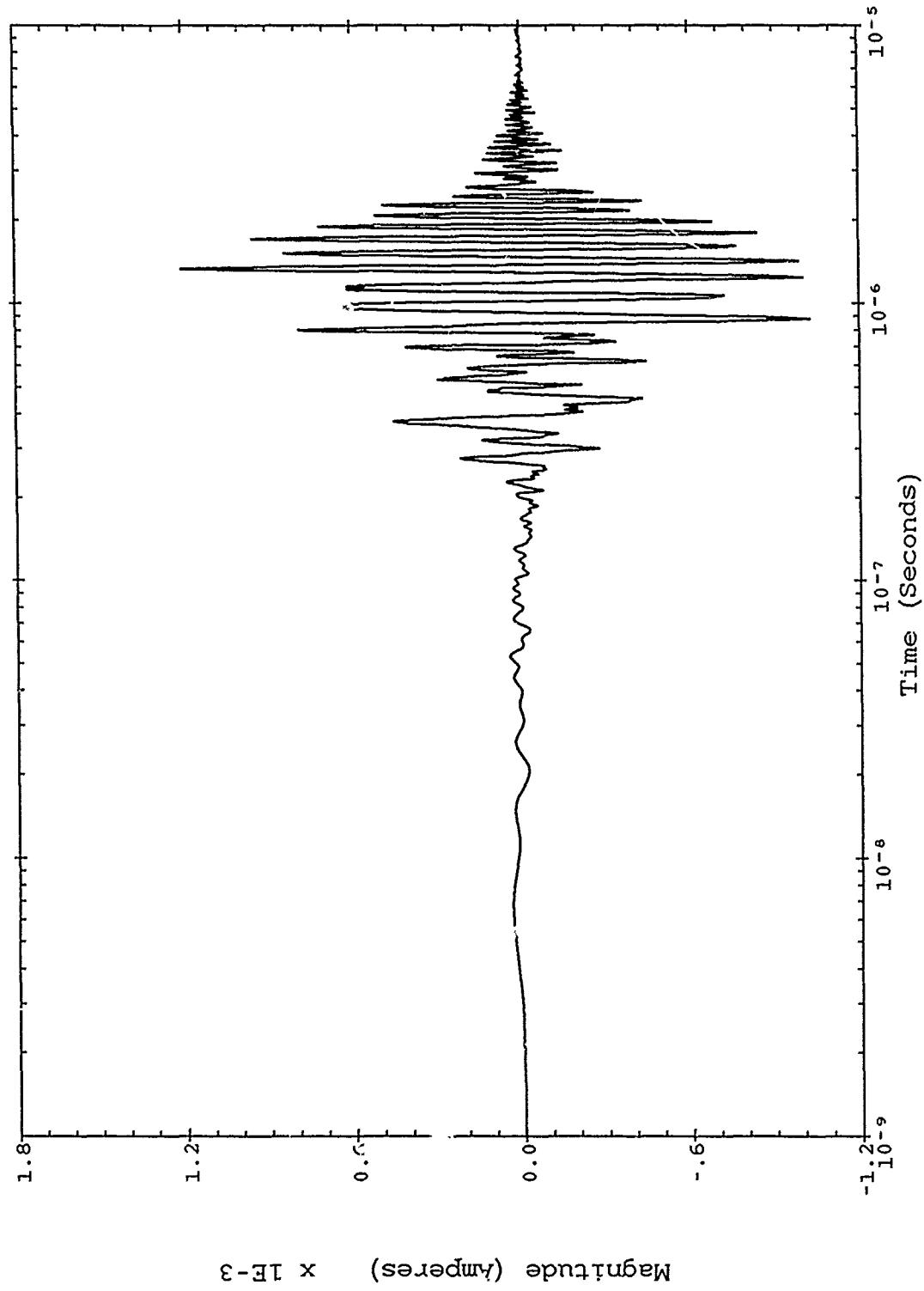


Figure B-32. Corrected TRESTLE data; TP 0594 SN 2584.

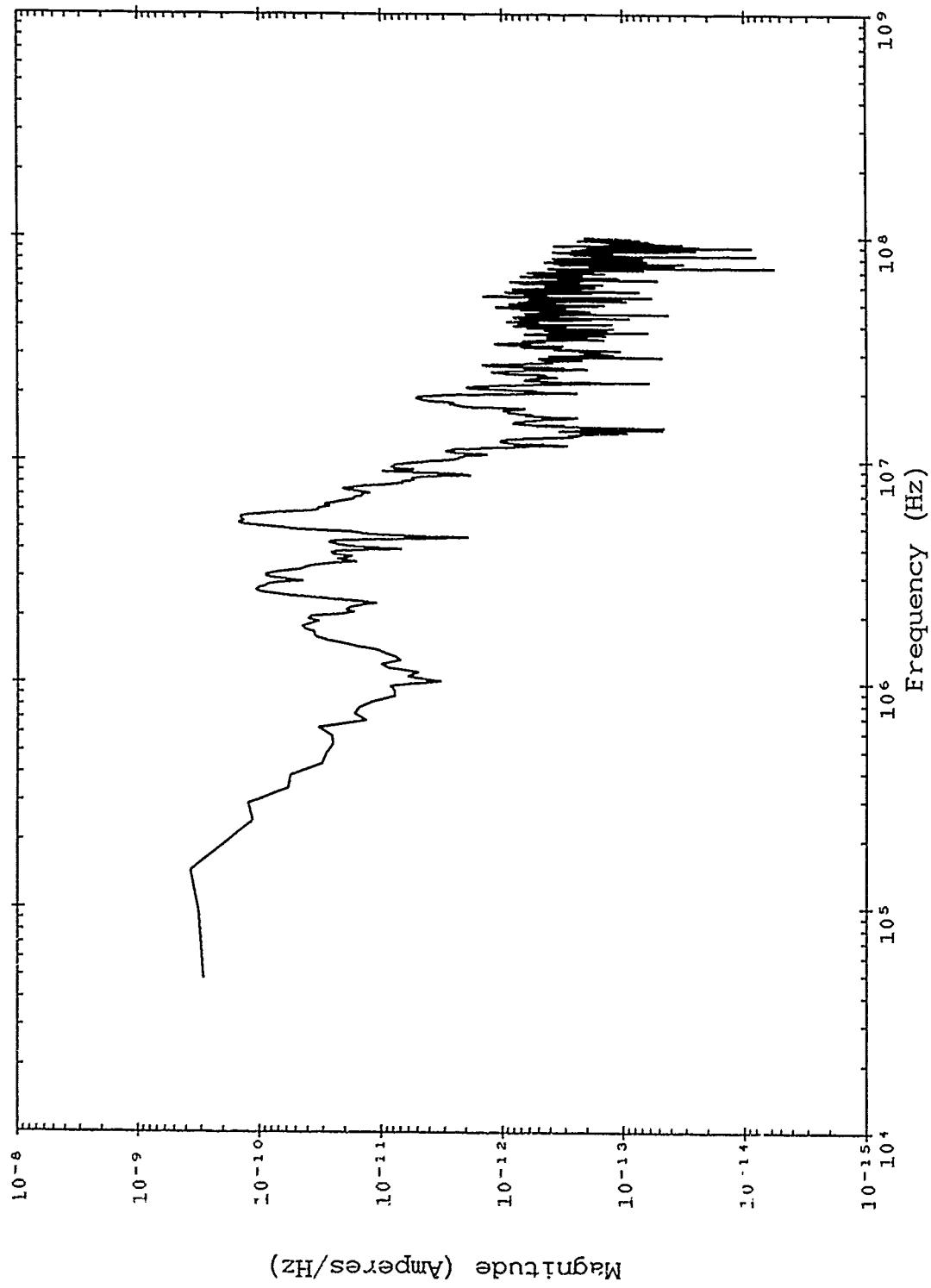


Figure B-33. Severe nearby lightning threat; TP 0594 SN 2584.

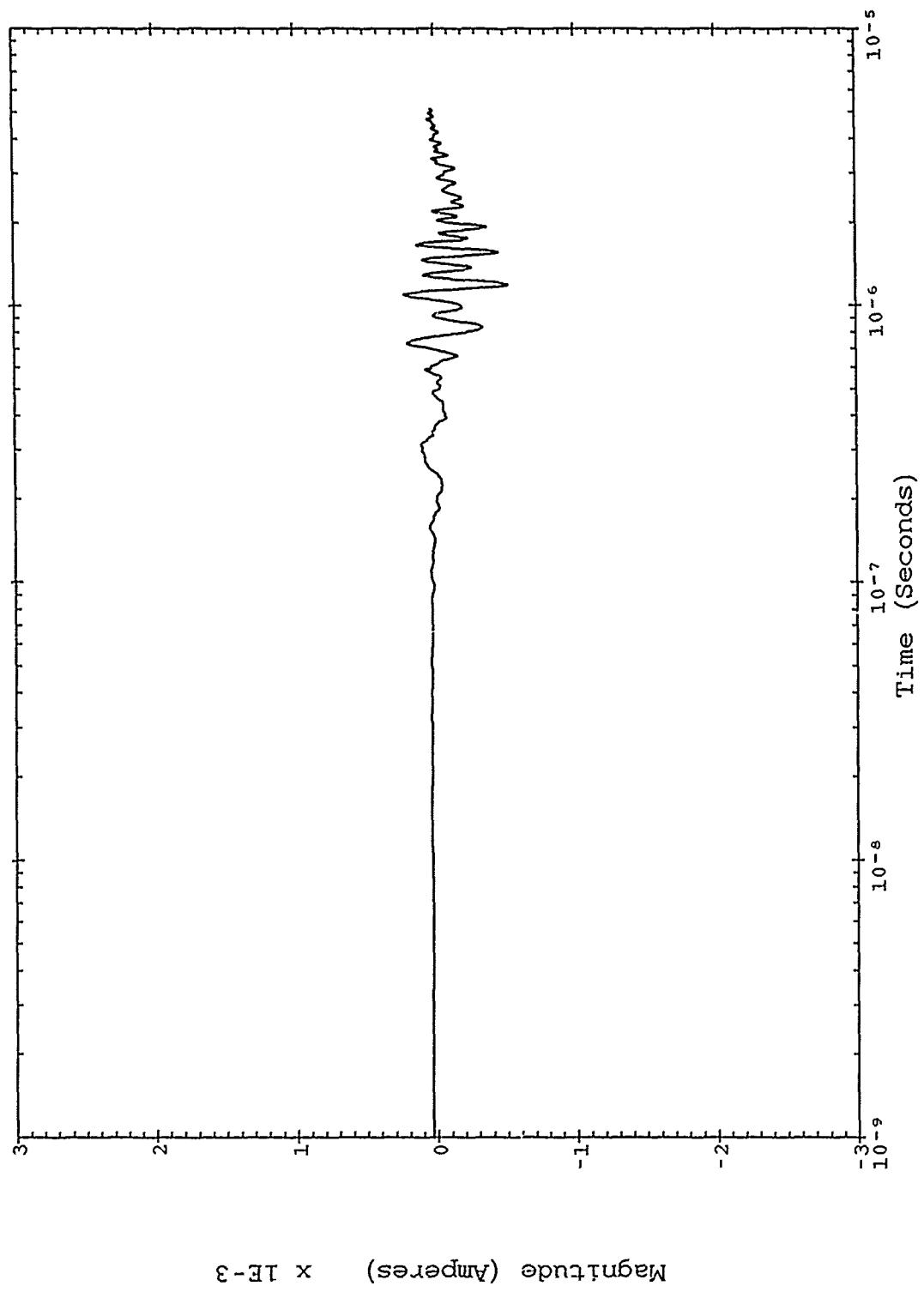


Figure B-34. Severe nearby lightning threat; TP 0594 SN 2584.

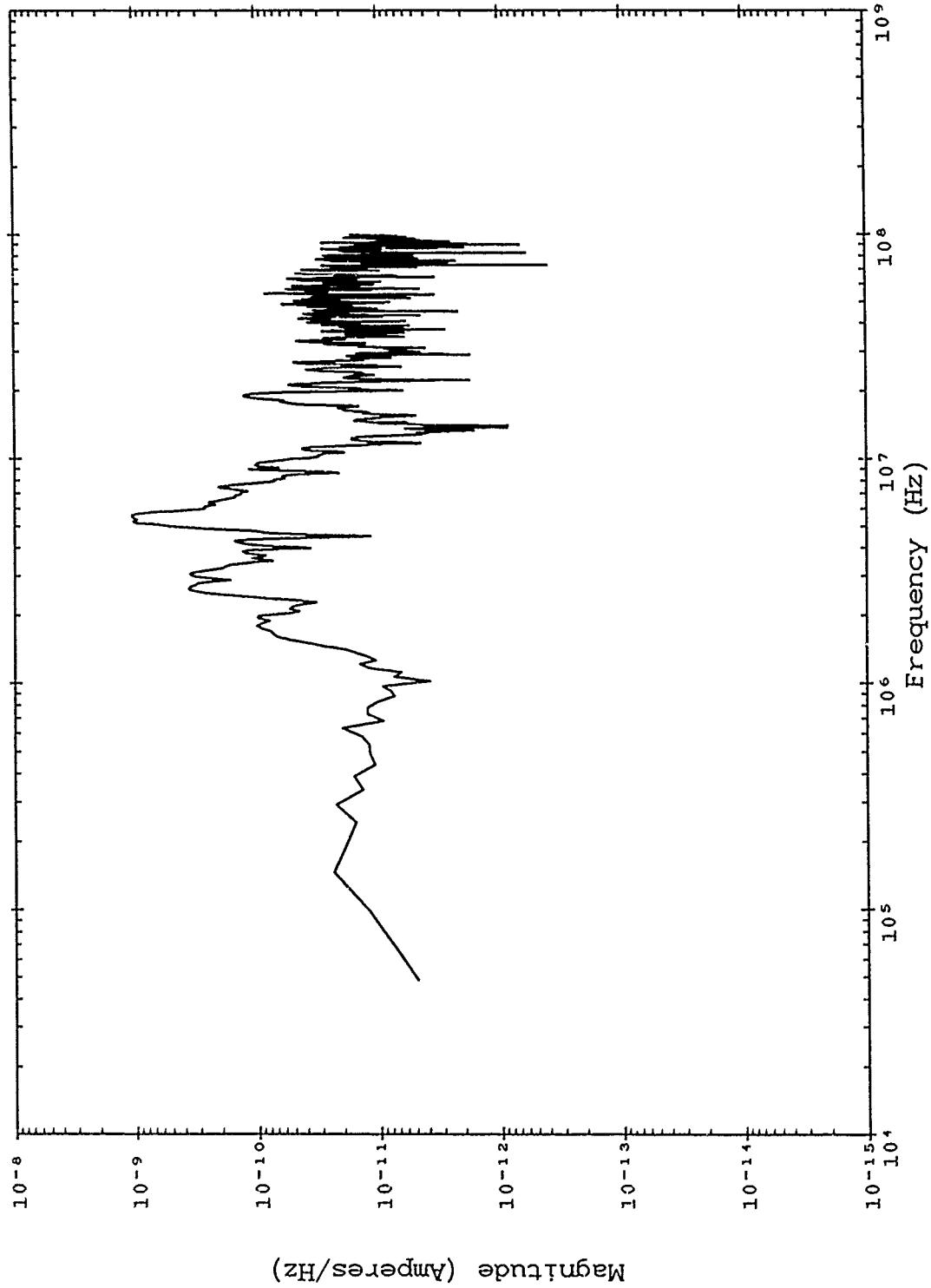


Figure B-35. Double exponential threat; TP 0594 SN 2584.

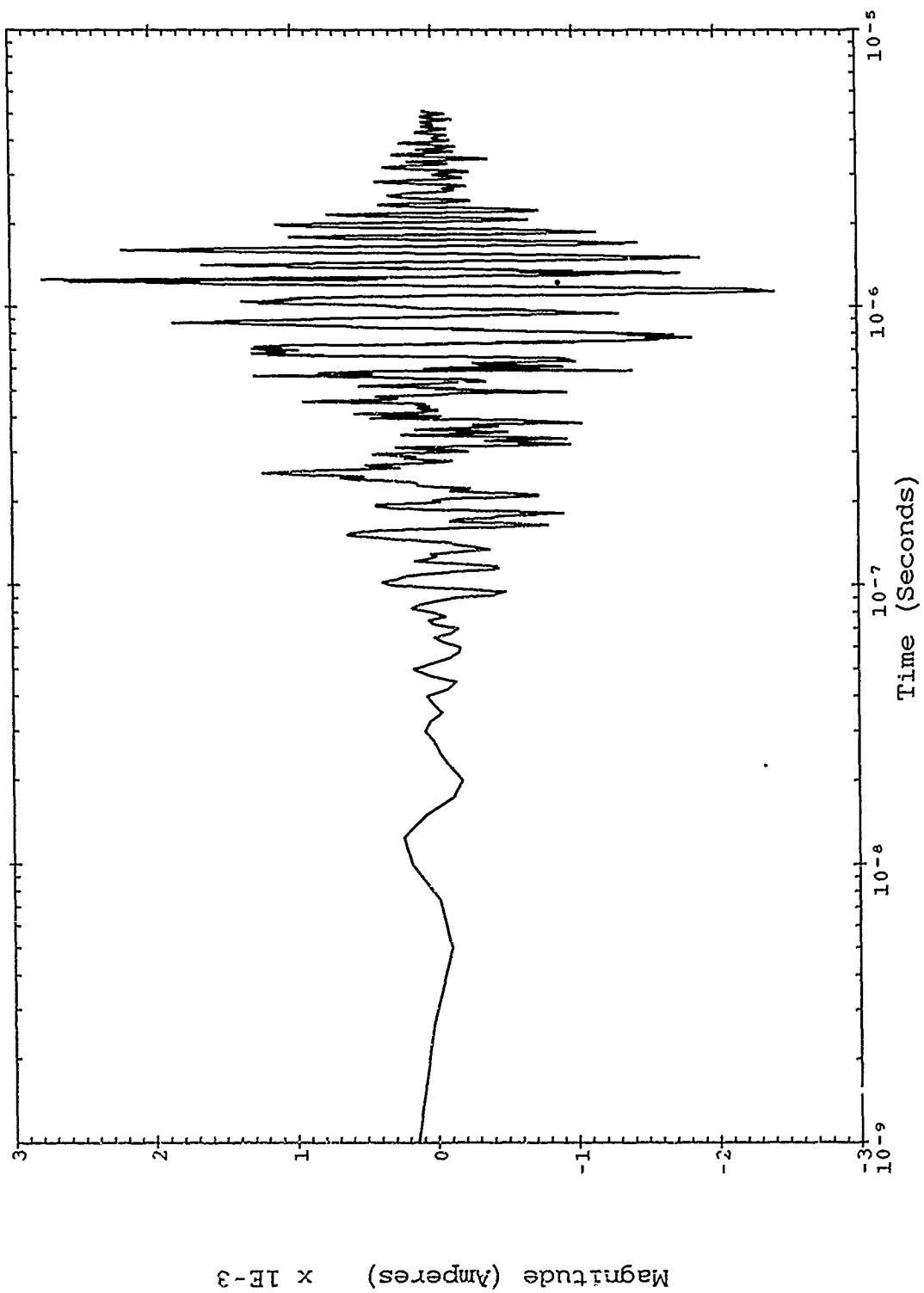


Figure B-36. Double exponential threat; TP 0594 SN 2584.

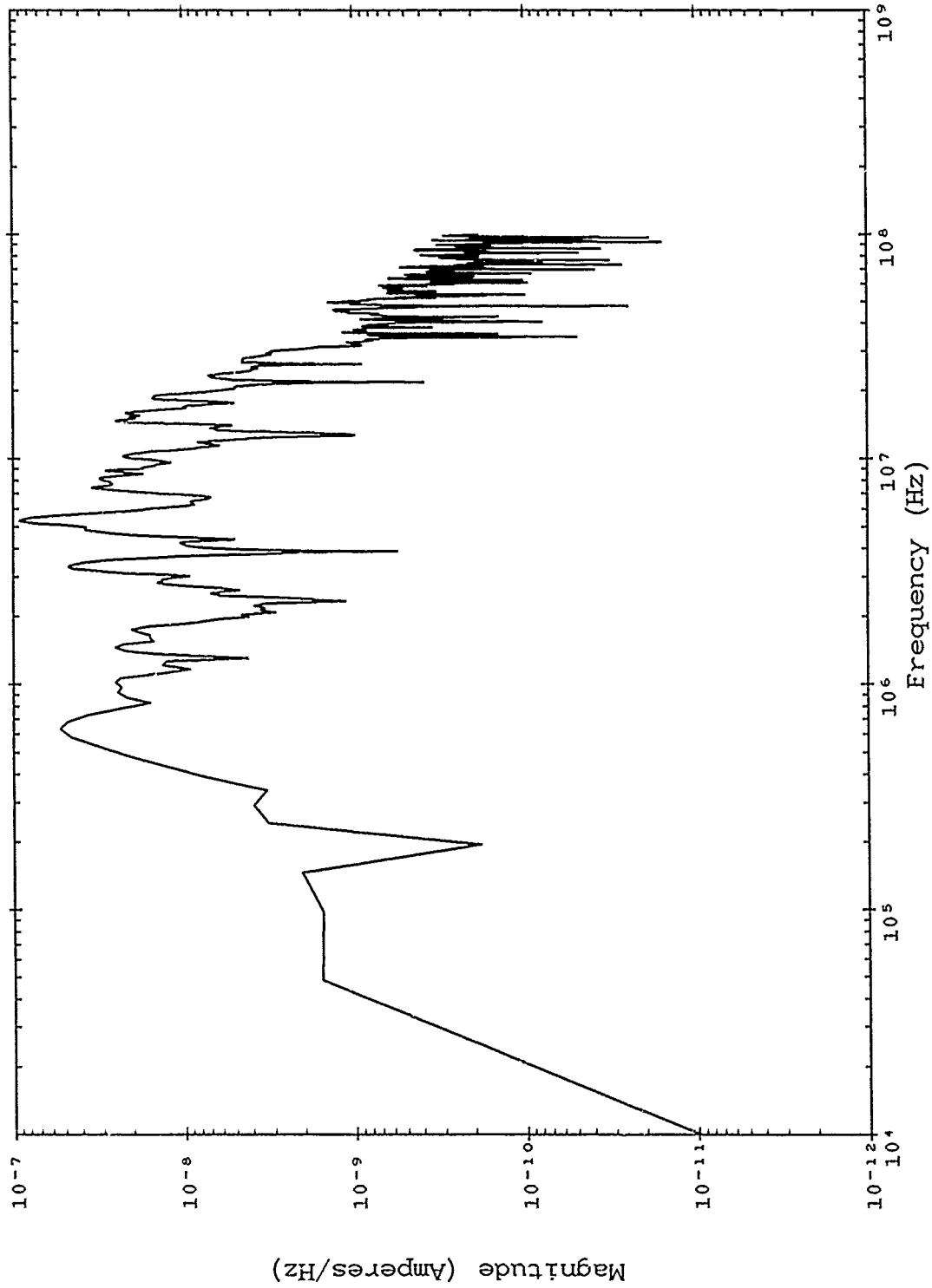


Figure B-37. Corrected TRESTLE data; TP 0643 SN 2261.

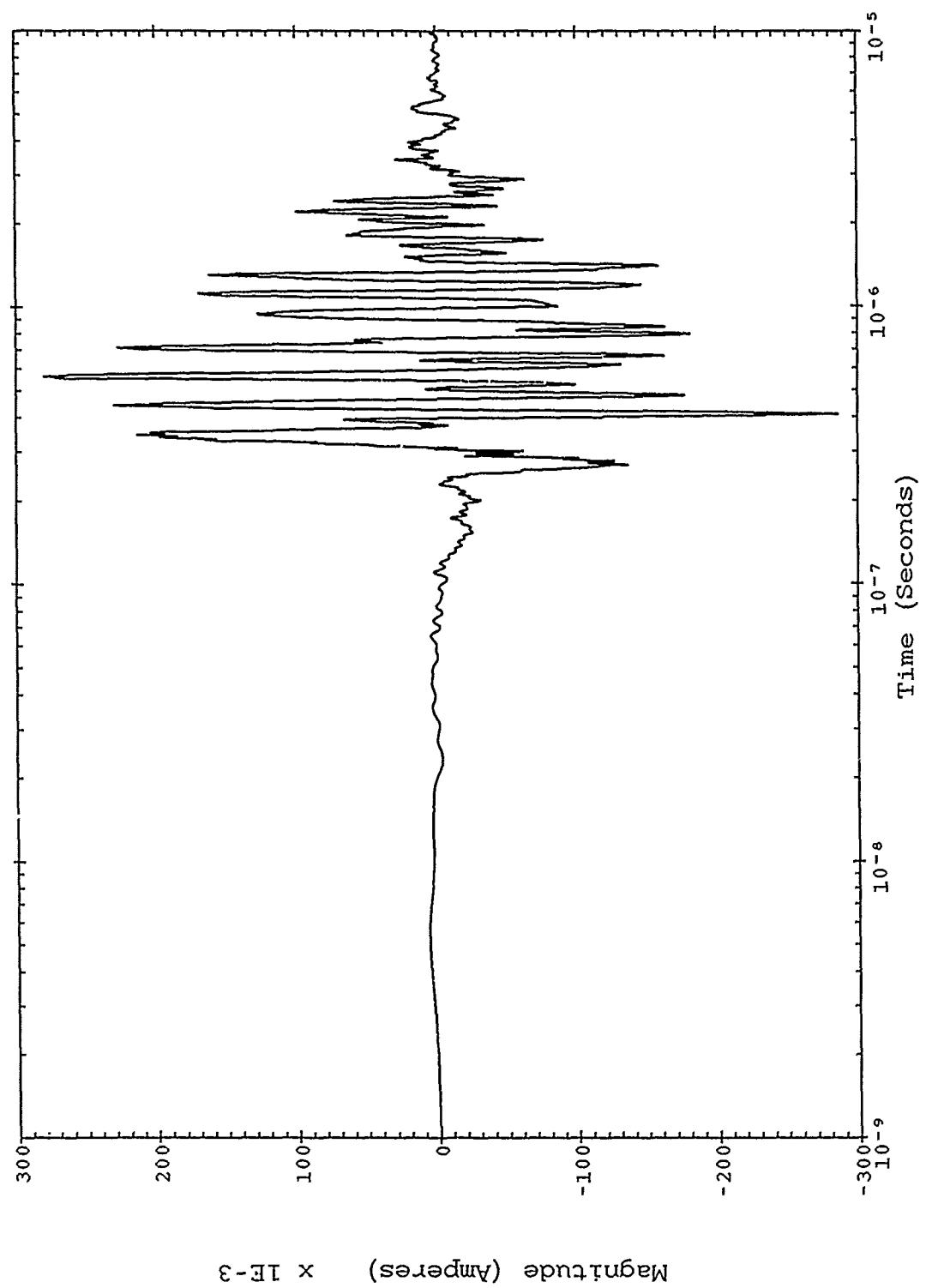


Figure B-38. Corrected TRESTLE data; TP 0643 SN 2261.

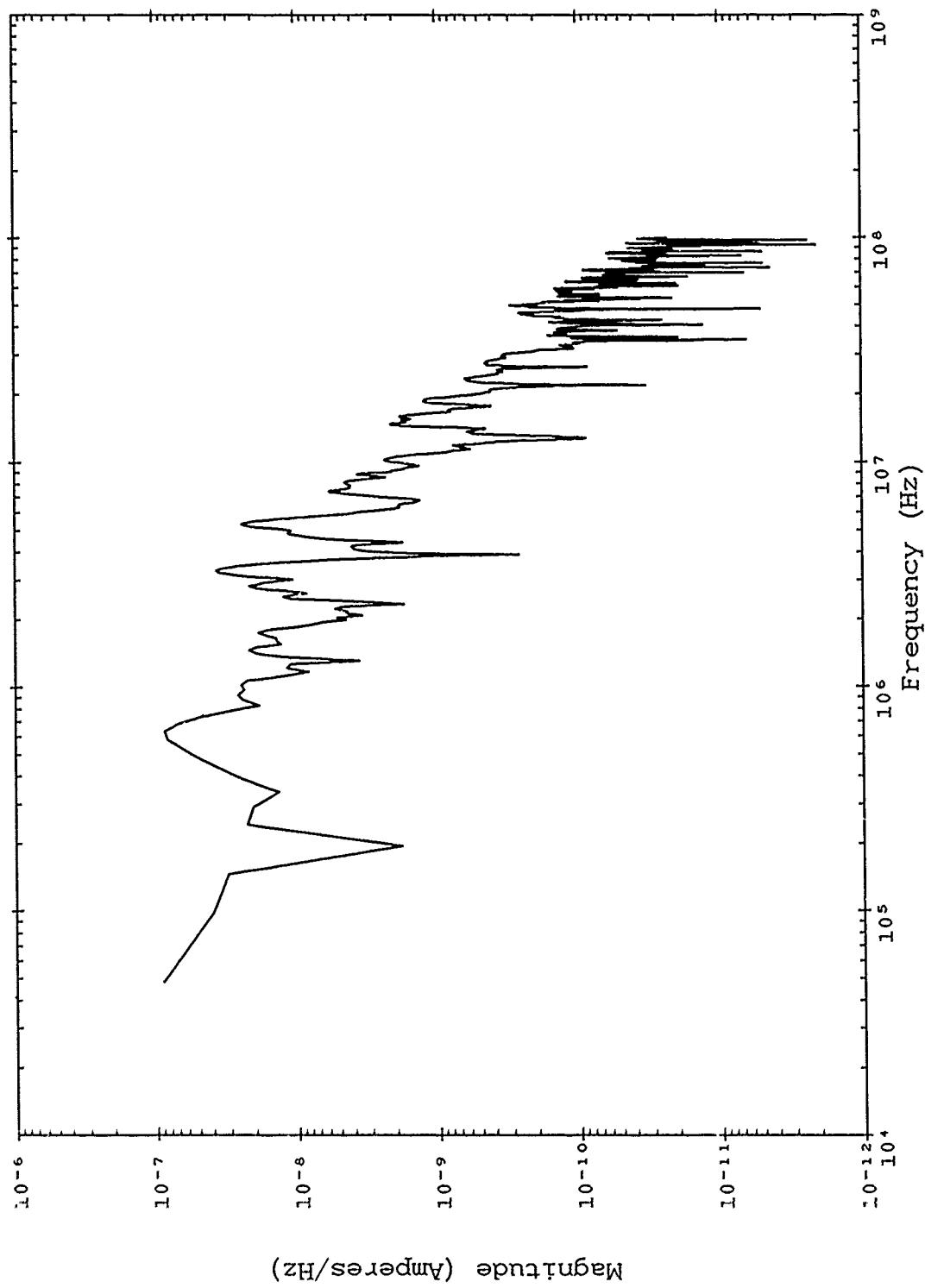


Figure B-39. Severe nearby lightning threat; TP 0643 SN 2261.

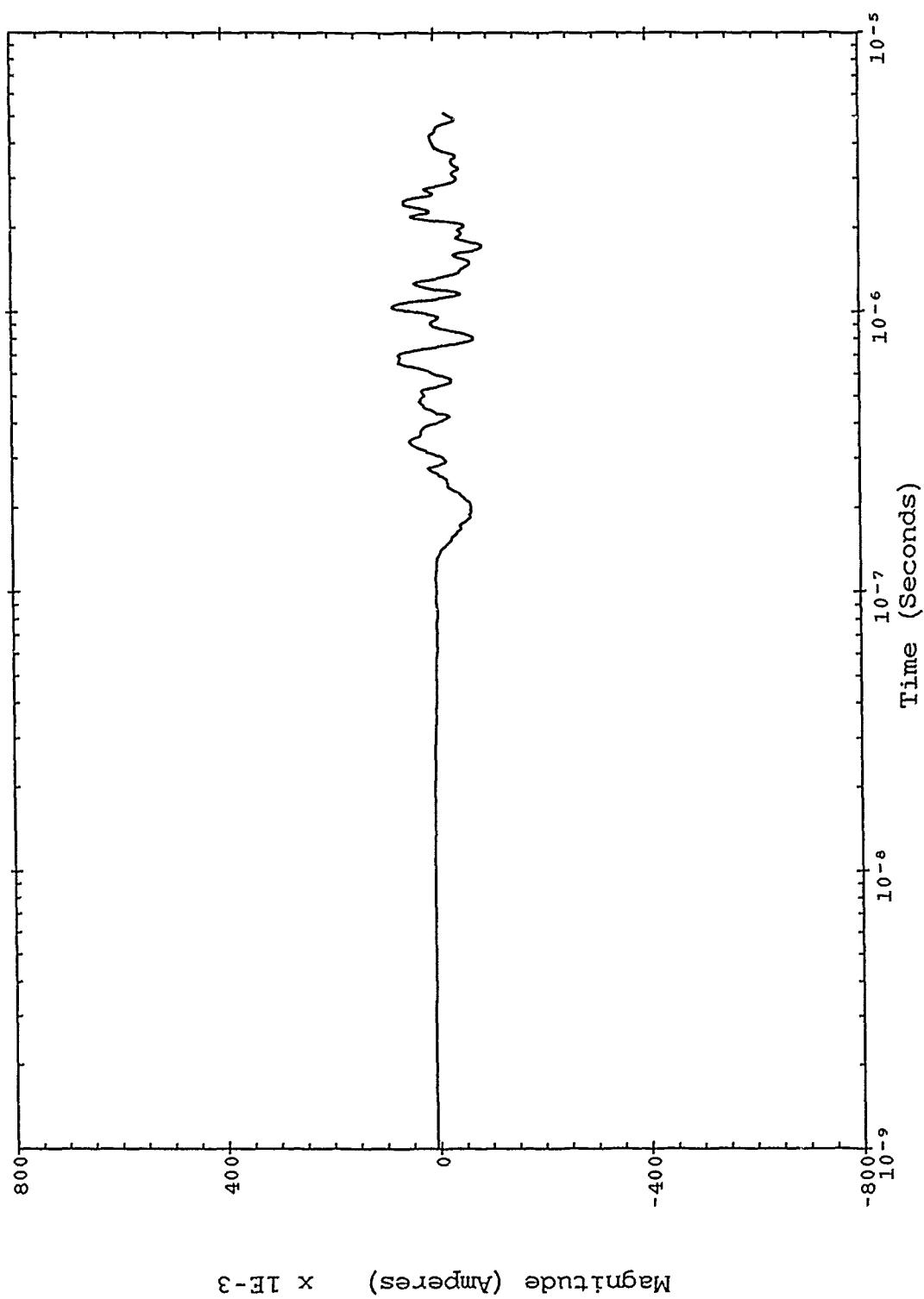


Figure B-40. Severe nearby lightning threat; TP 0643 SN 2261.

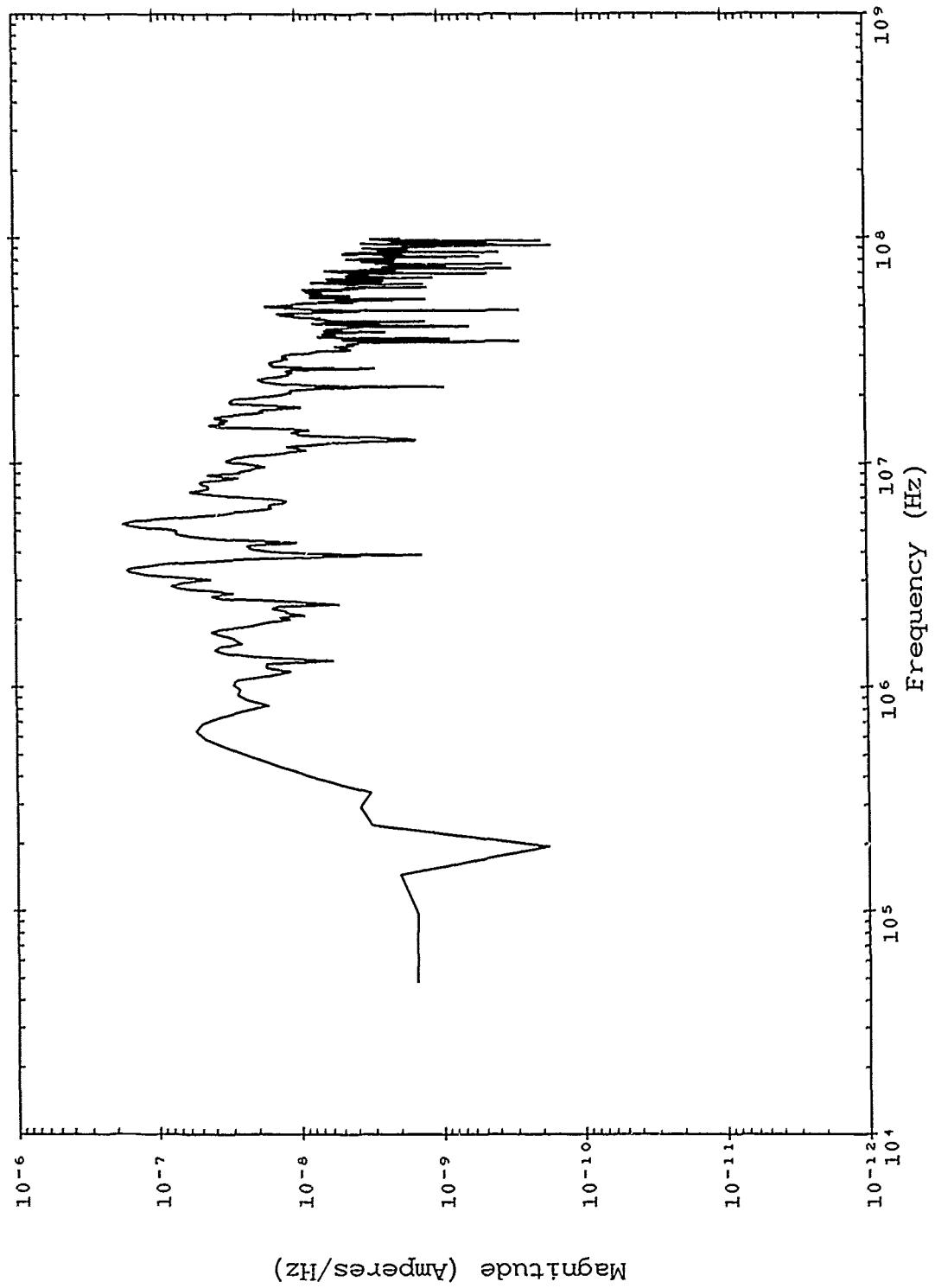


Figure B-41. Double exponential threat; TP 0643 SN 2261.

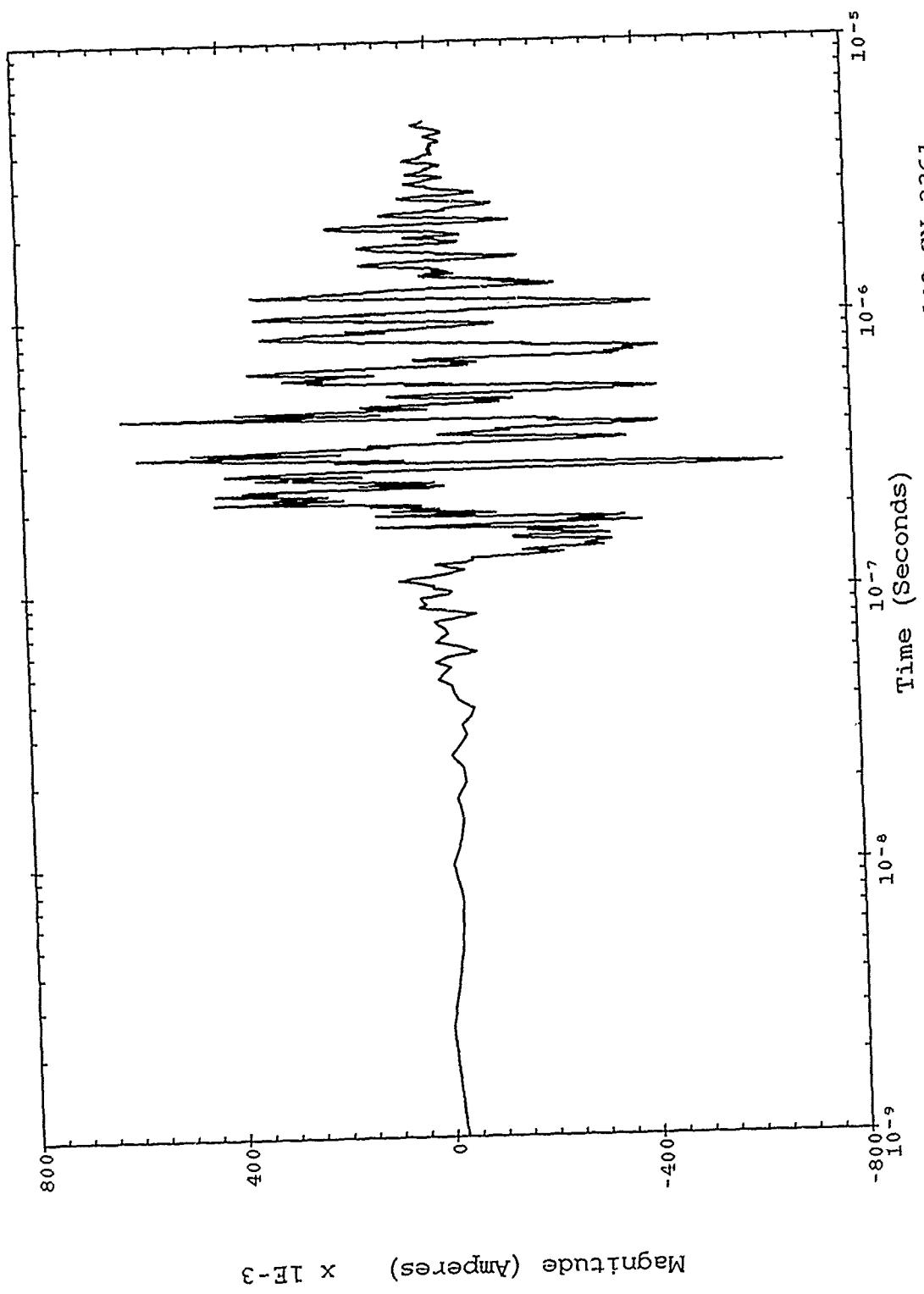


Figure B-42. Double exponential threat; TP 0643 SN 2261.

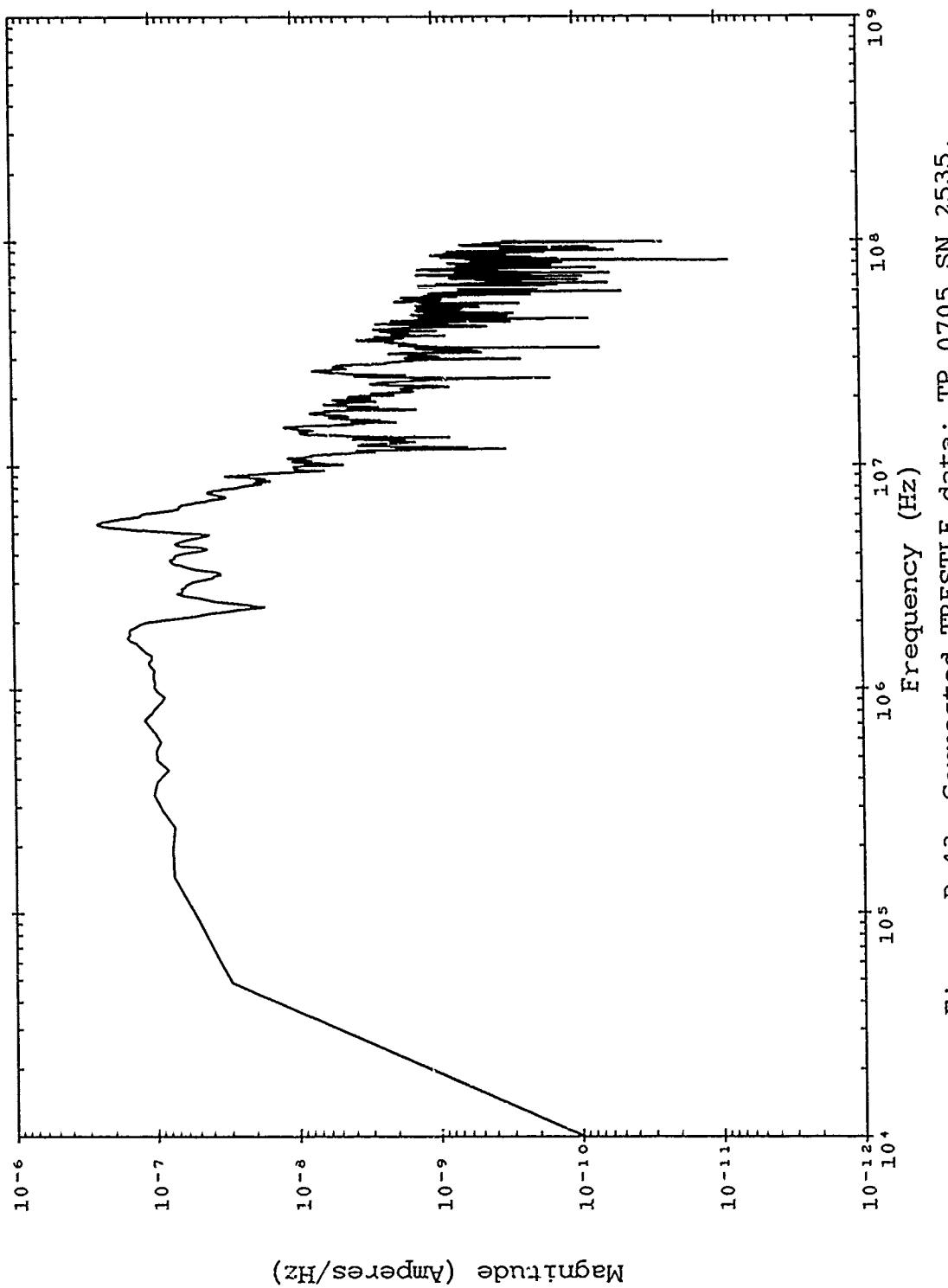


Figure B-43. Corrected TRESTLE data; TP 0705 SN 2535.

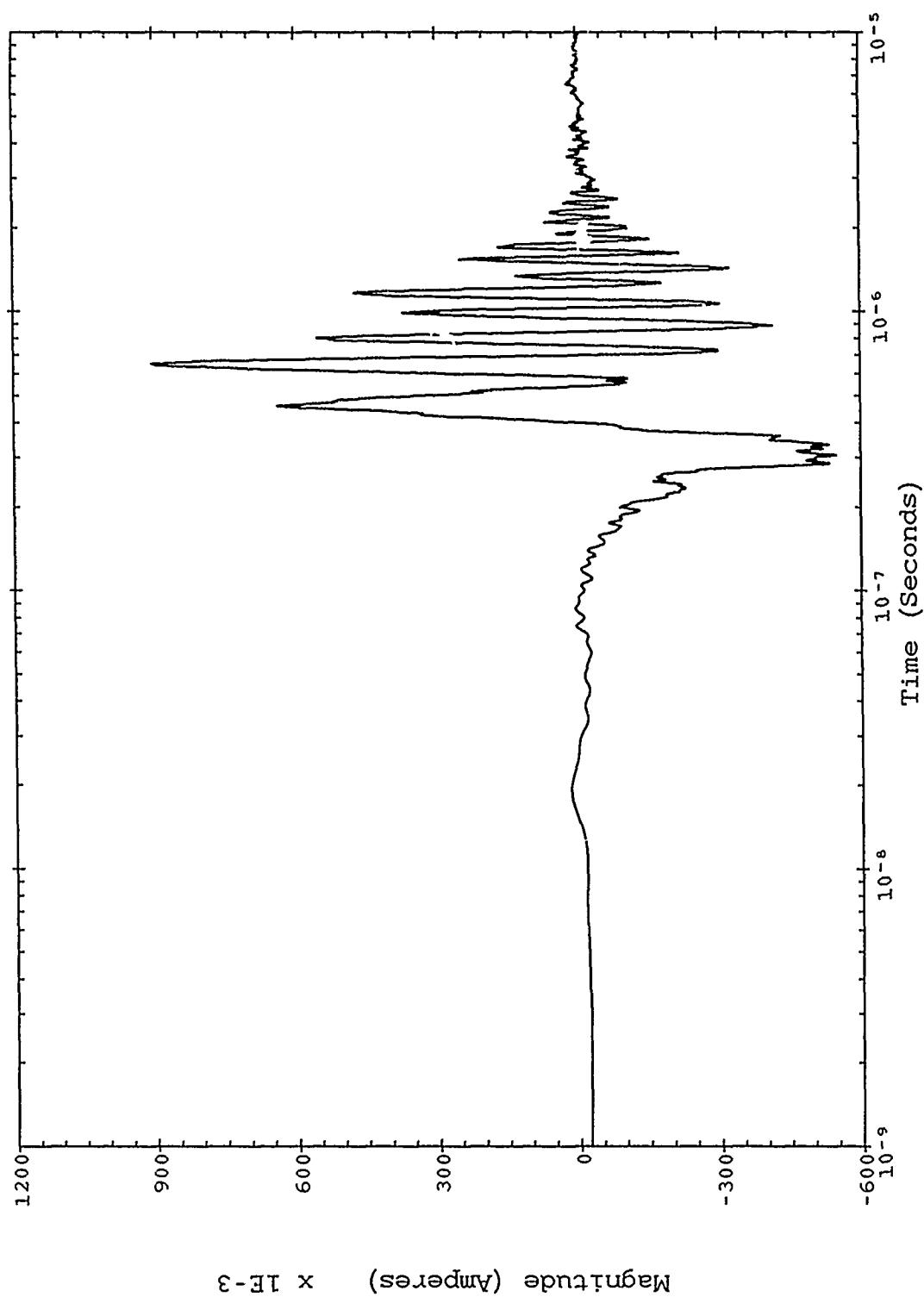


Figure B-44. Corrected TRESTLE data; TP 0705 SN 2535.

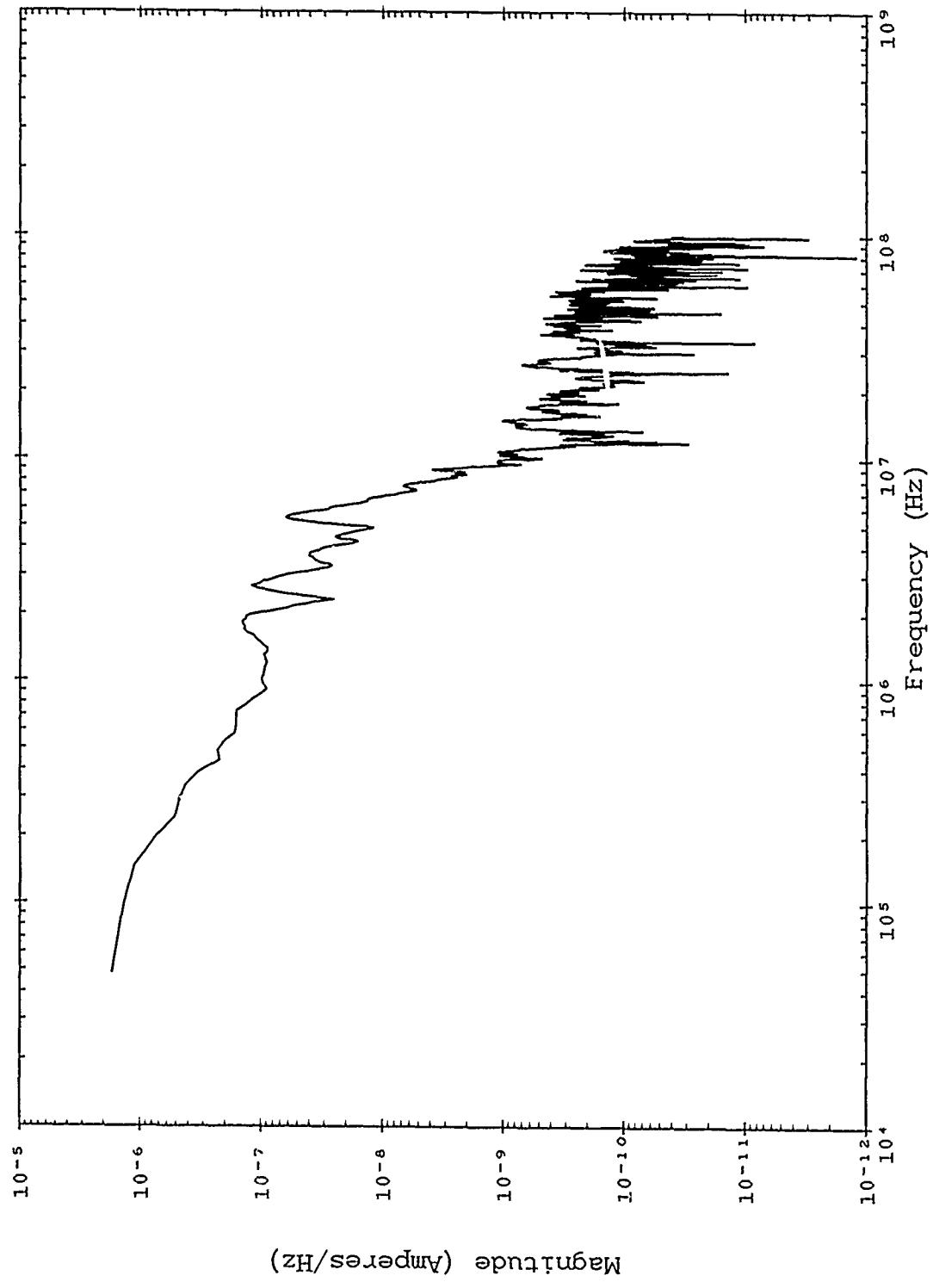


Figure B-45. Severe nearby lightning threat; TP 0705 SN 2535.

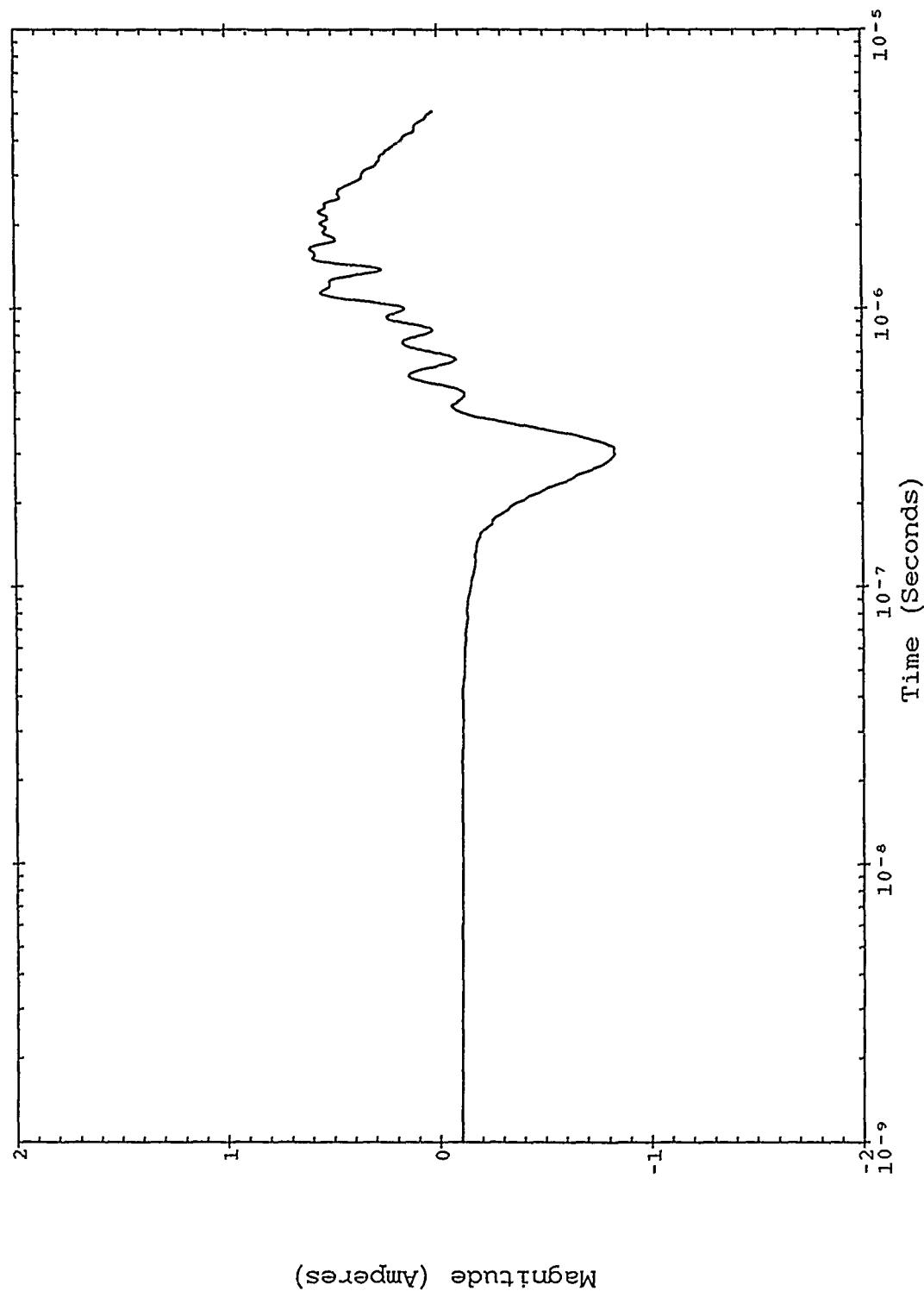


Figure B-46. Severe nearby lightning threat; TP 0705 SN 2535.

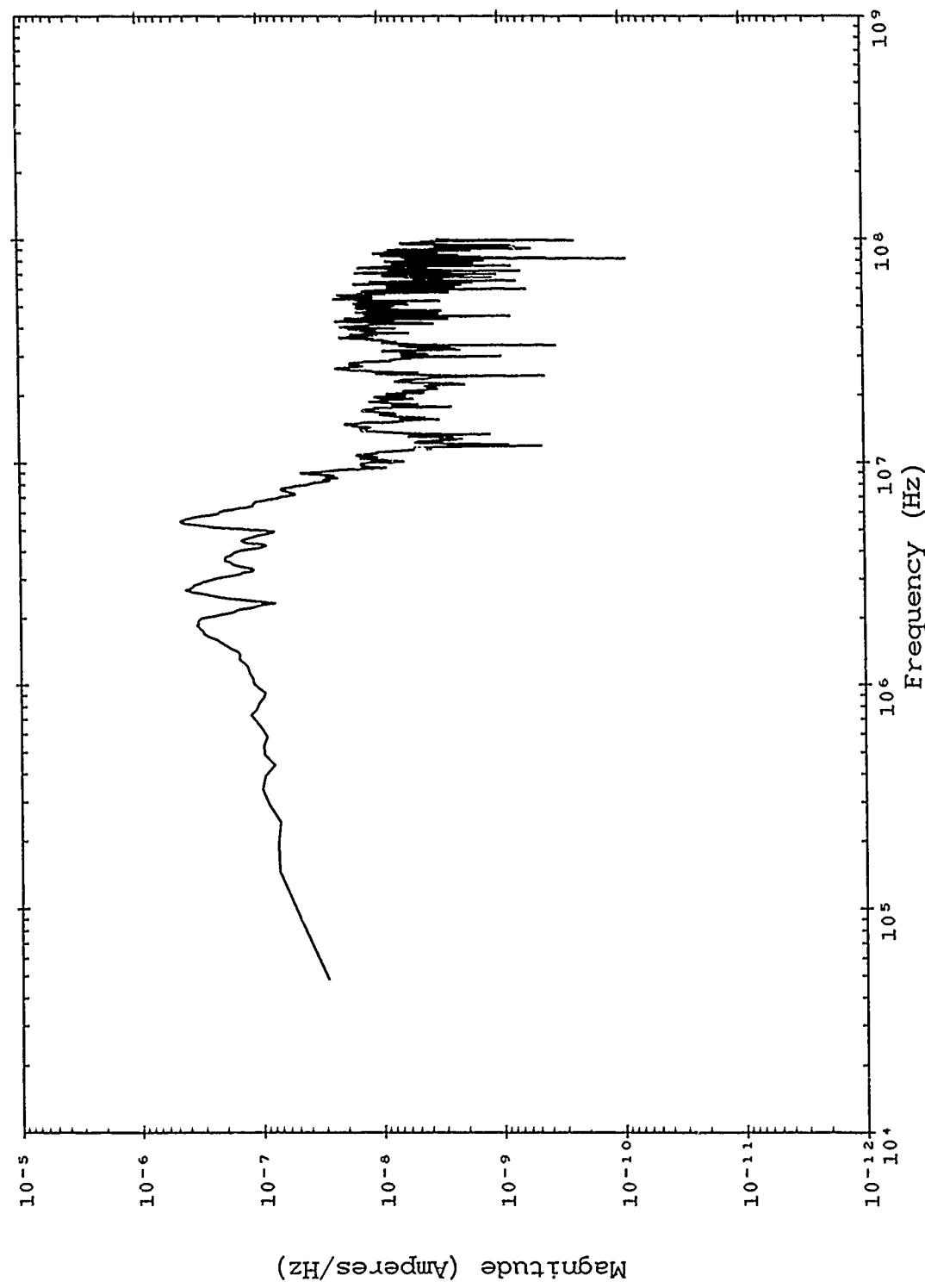


Figure B-47. Double exponential threat; TP 0705 SN 2535.

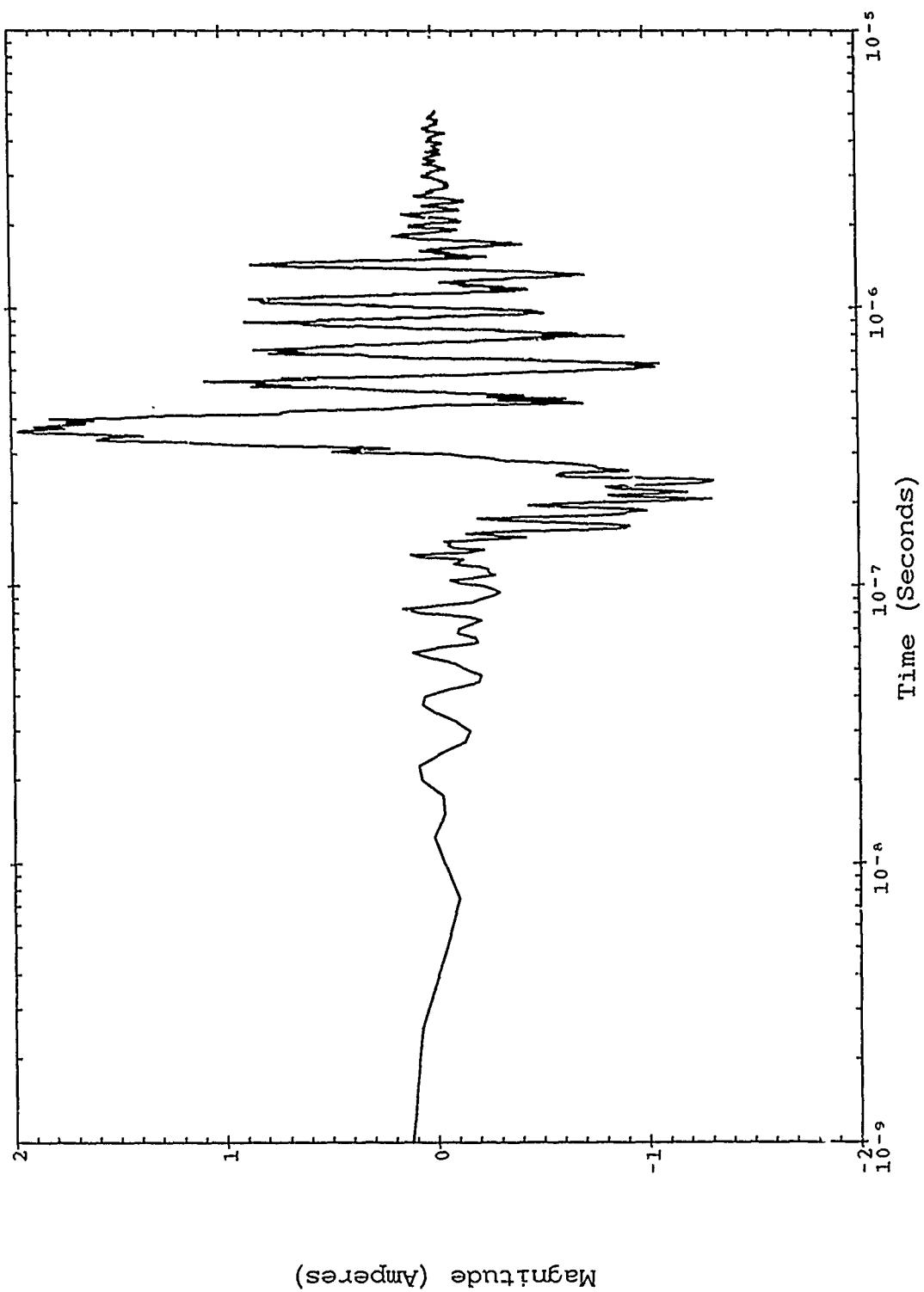


Figure B-48. Double exponential threat; TP 0705 SN 2535.

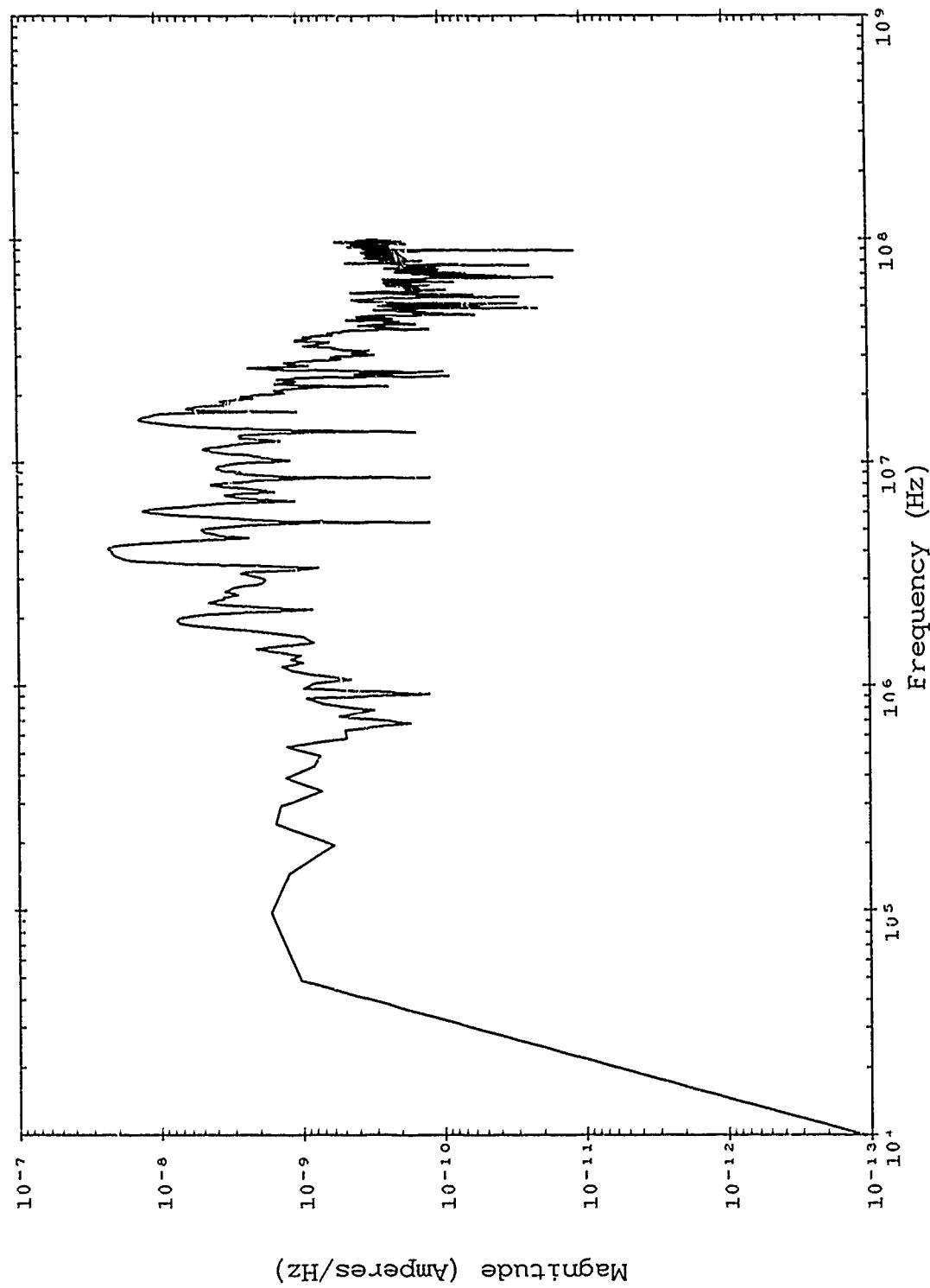


Figure B-49. Corrected TRESTLE data; TP 0715 SN 1798.

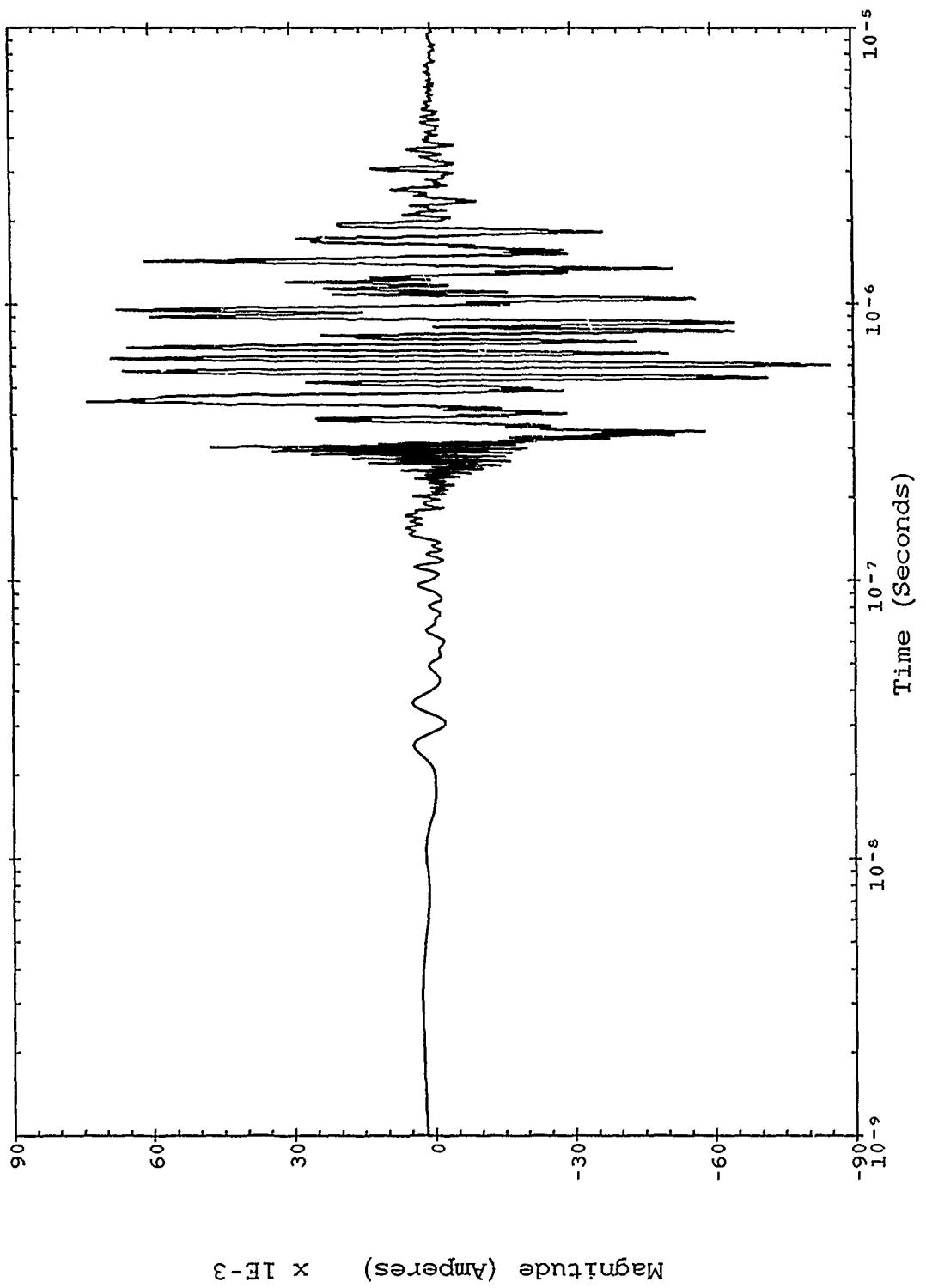


Figure B-50. Corrected TRESTLE data; TP 0715 SN 1798.

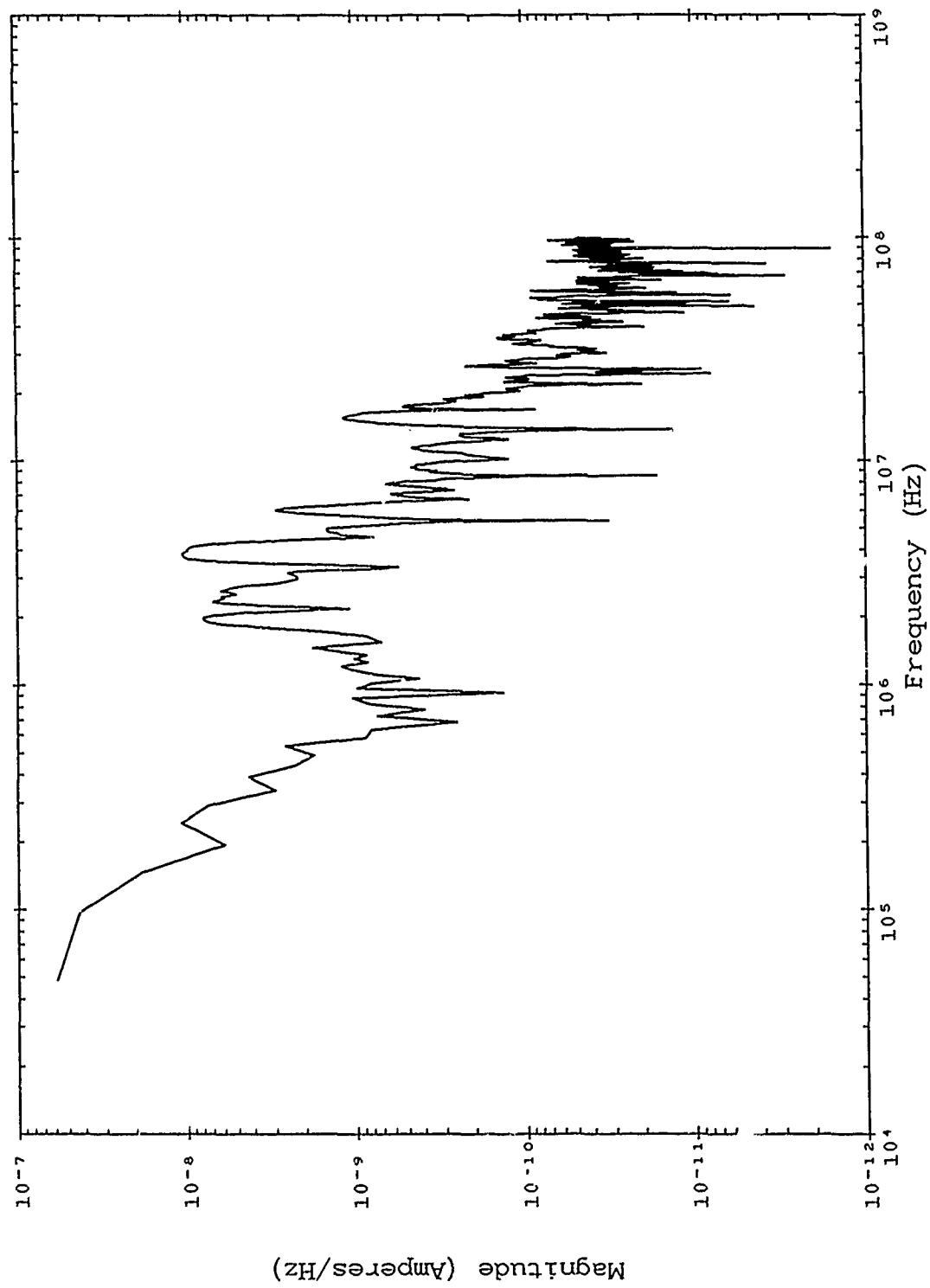


Figure B-51. Severe nearby lightning threat; TP 0715 SN 1798.

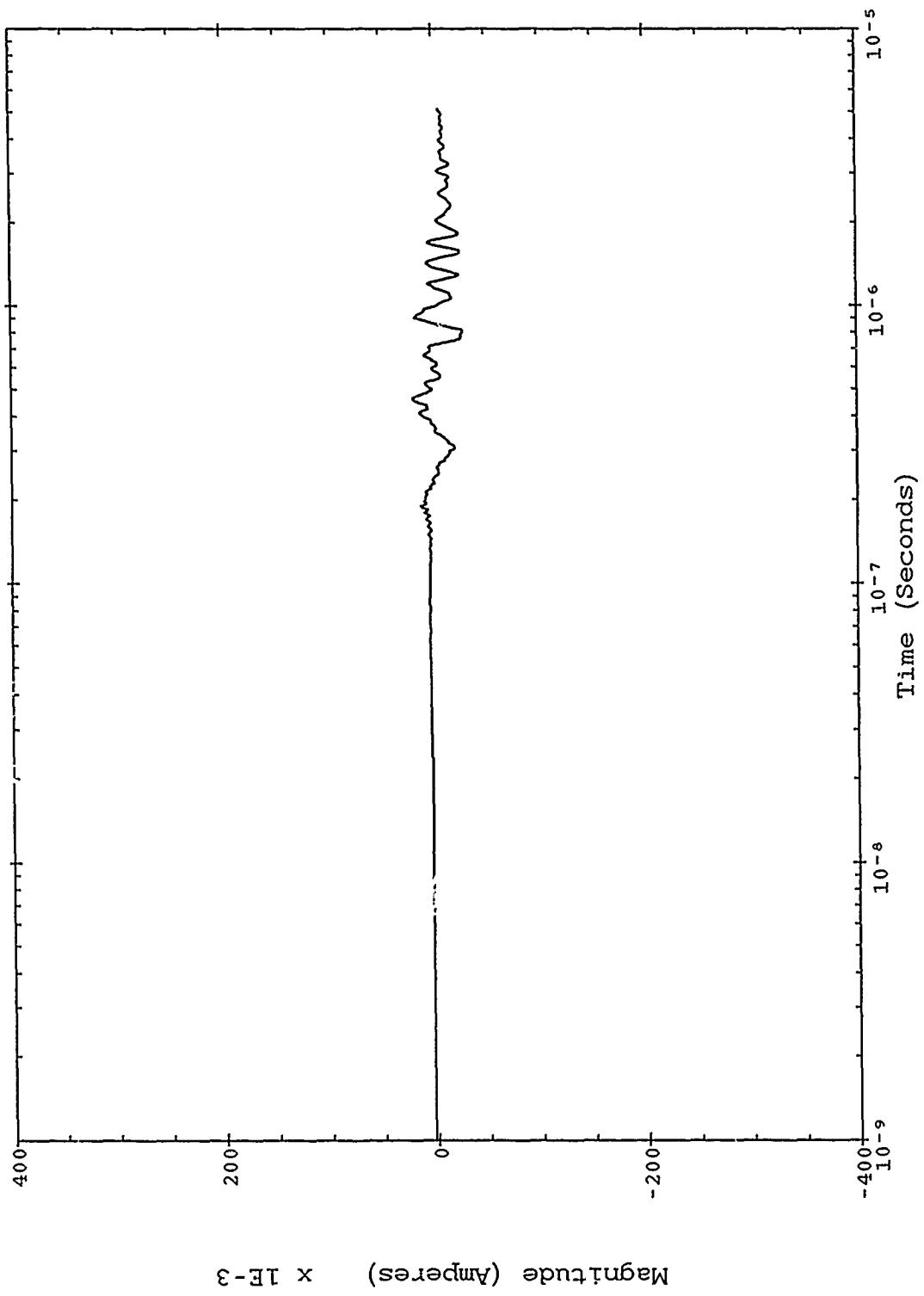


Figure B-52. Severe nearby lightning threat; TP 0715 SN 1798.

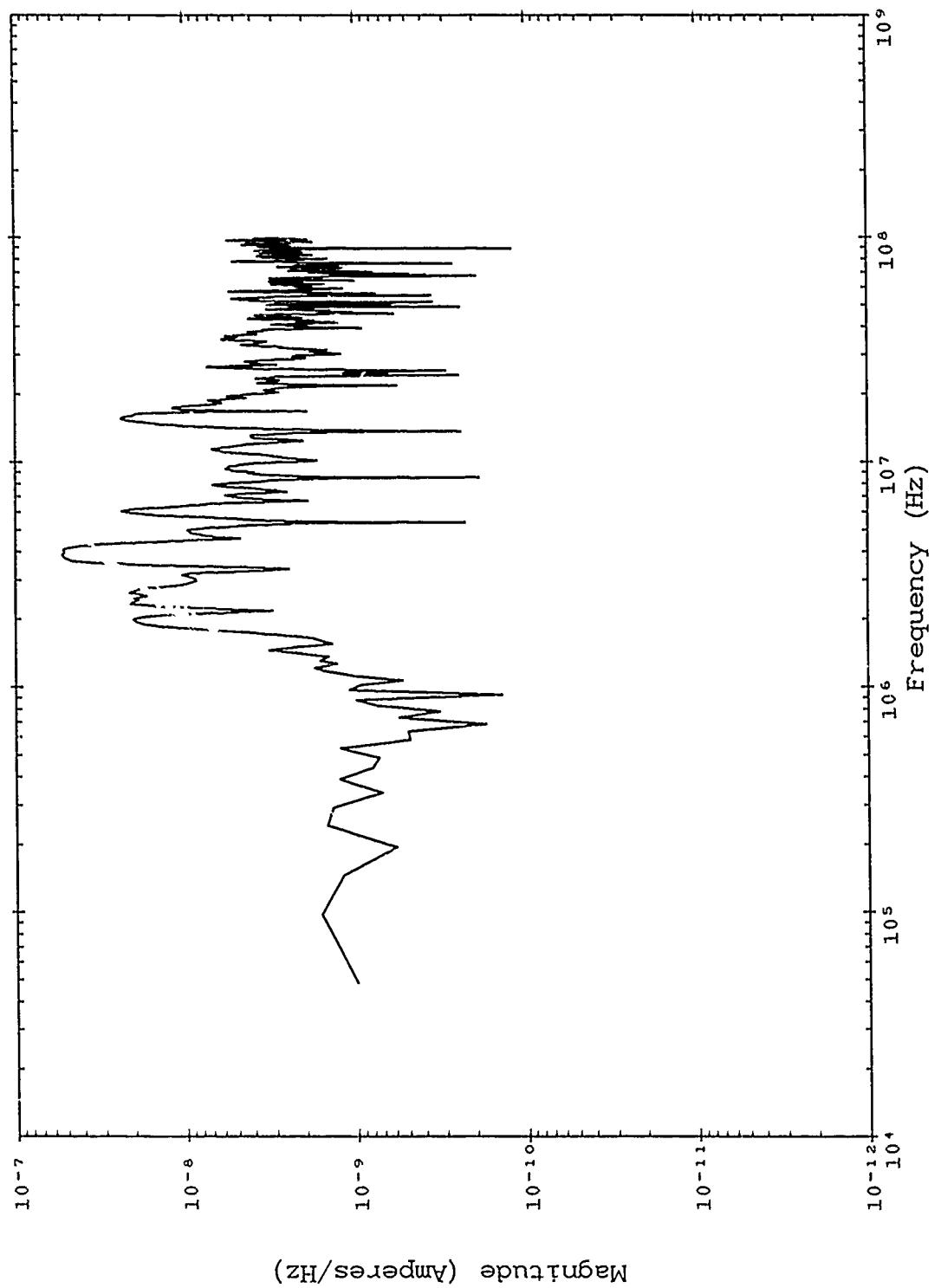


Figure B-53. Double exponential threat; TP 0715 SN 1798.

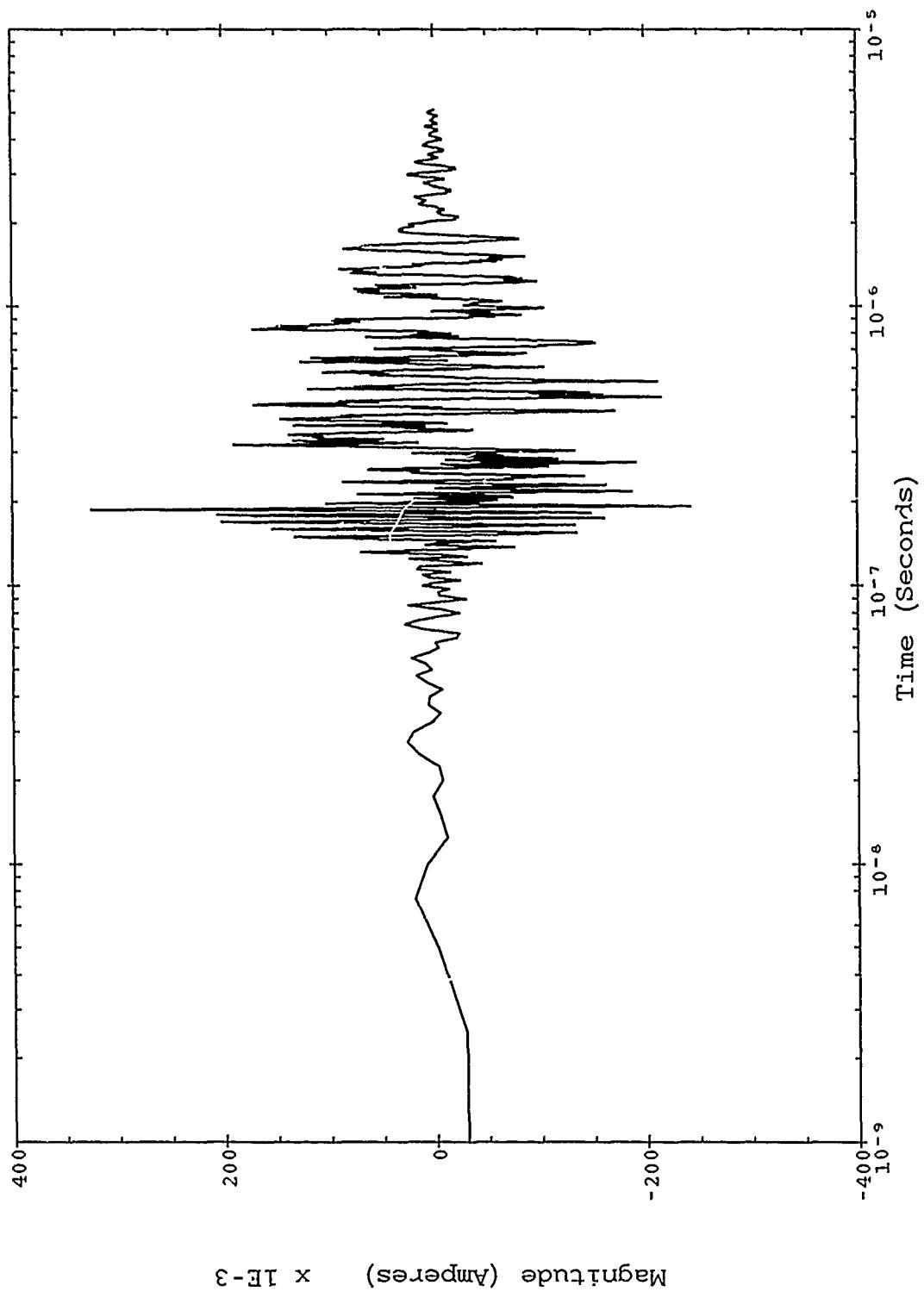


Figure B-54. Double exponential threat; TP 0715 SN 1798.

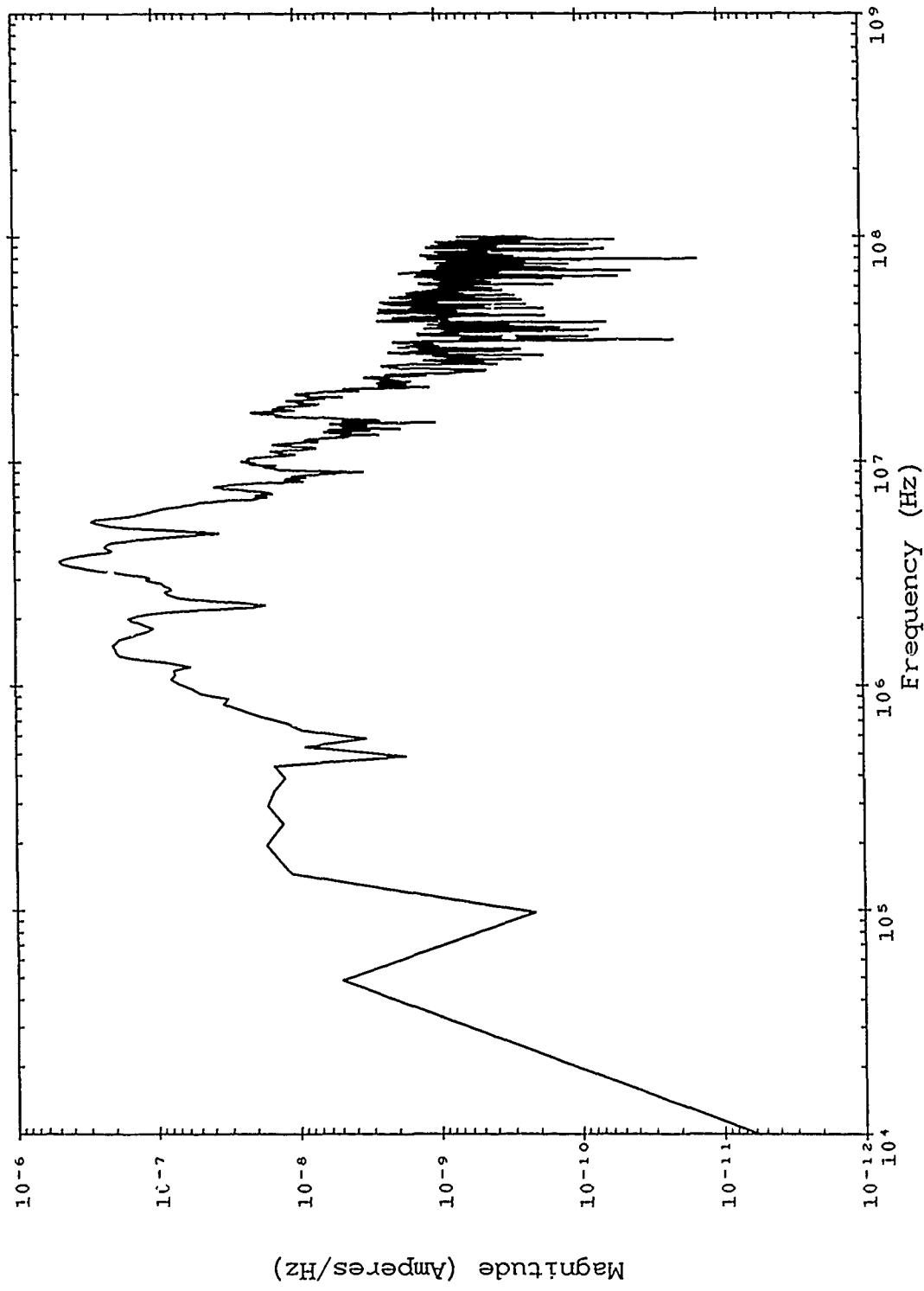


Figure B-55. Corrected TRESTLE data; TP 0723 SN 2256.

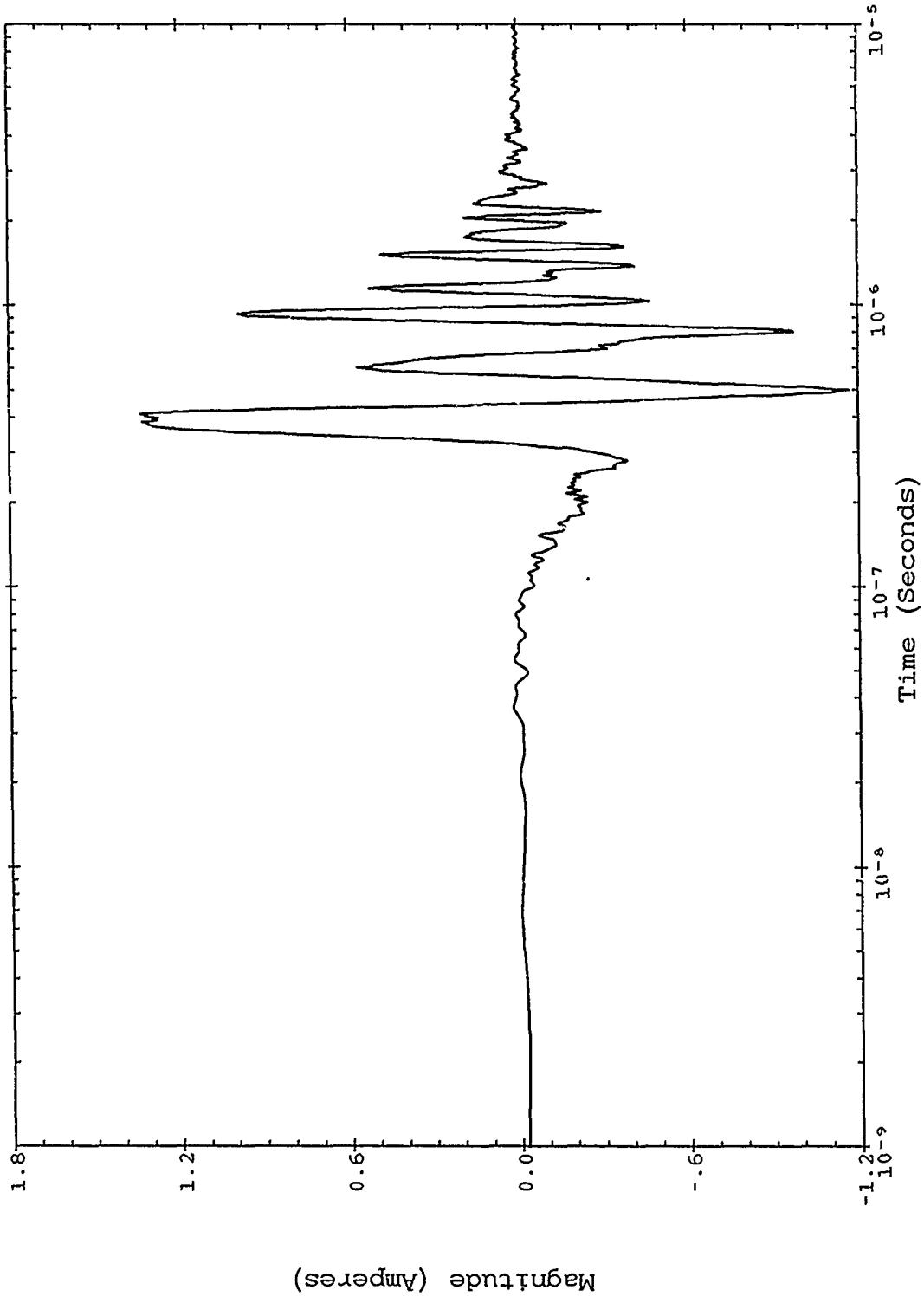


Figure B-56. Corrected TRESTLE data; TP 0723 SN 2256.

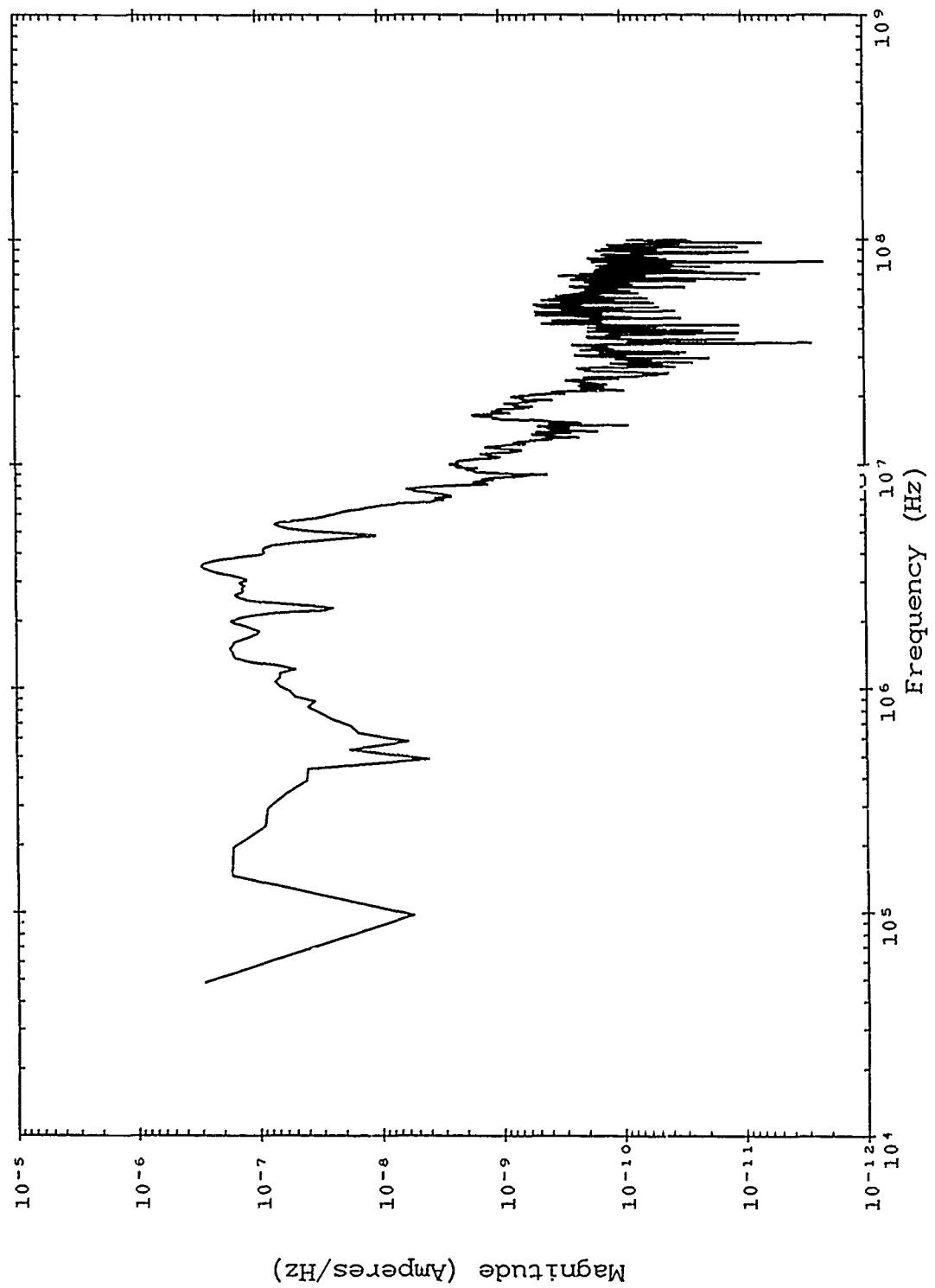


Figure B-57. Severe nearby lightning threat; TP 0723 SN 2256.

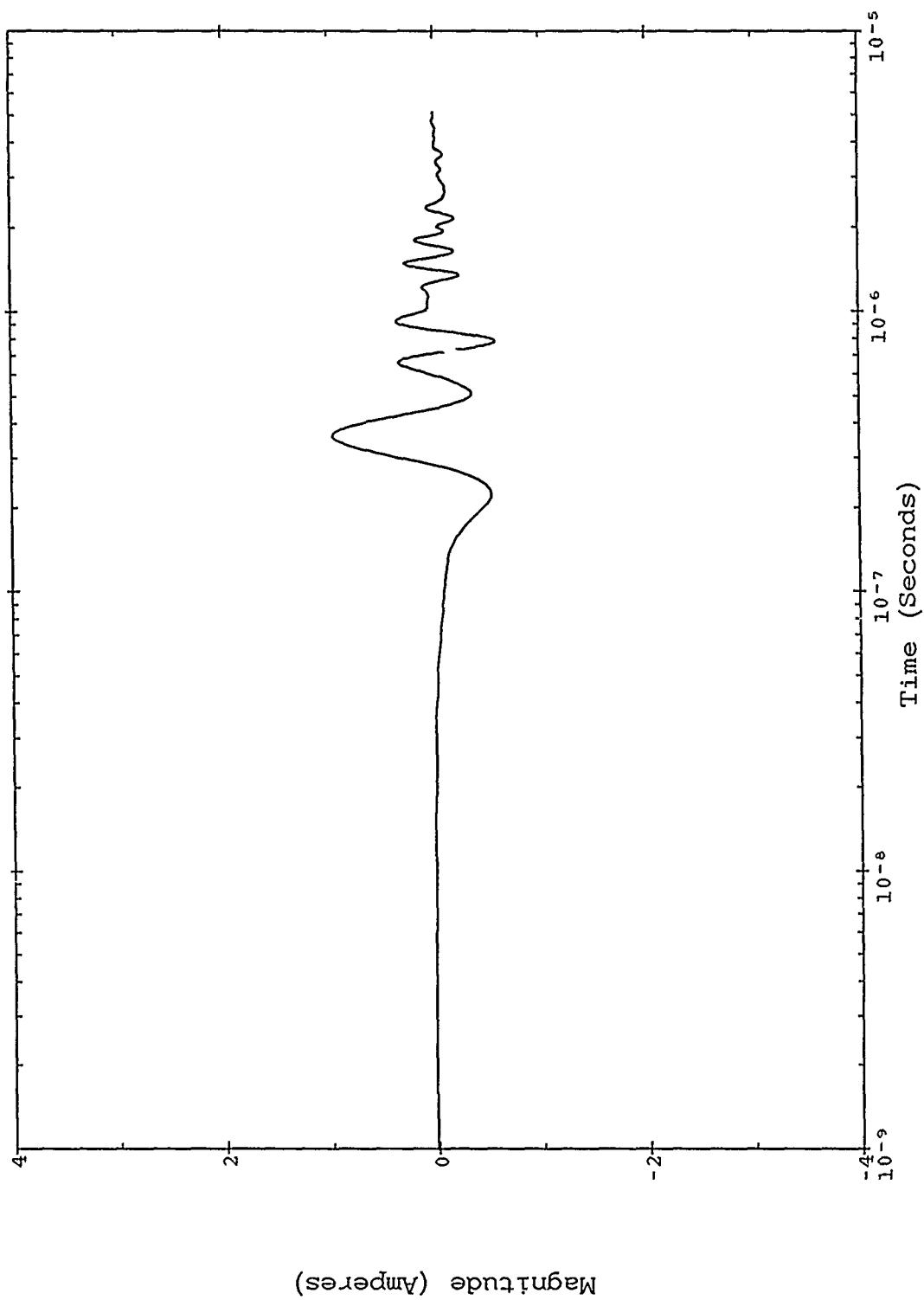


Figure B-58. Severe nearby lightning threat; TP 0723 SN 2256.

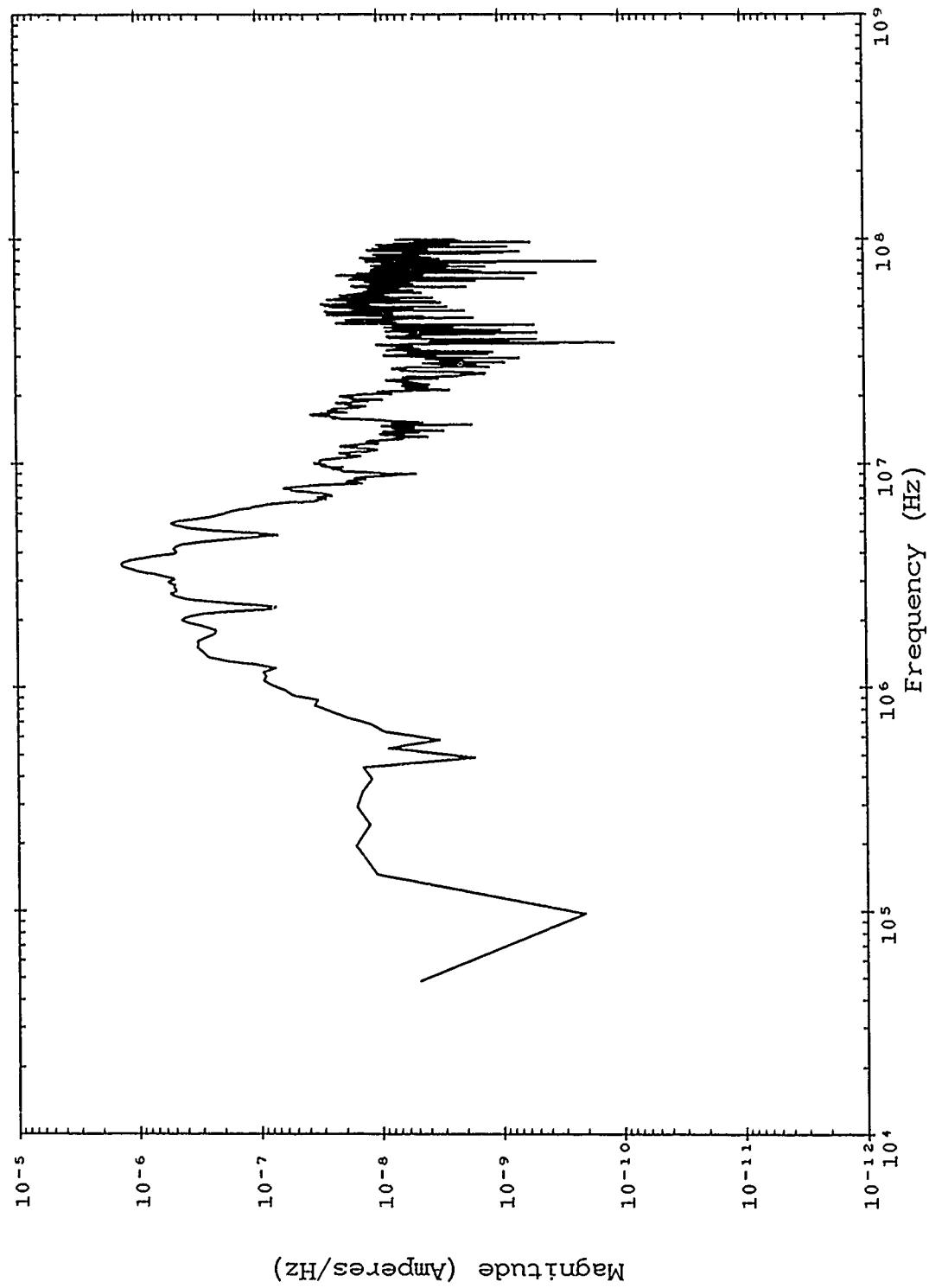


Figure B-59. Double exponential threat; TP 0723 SN 2256.

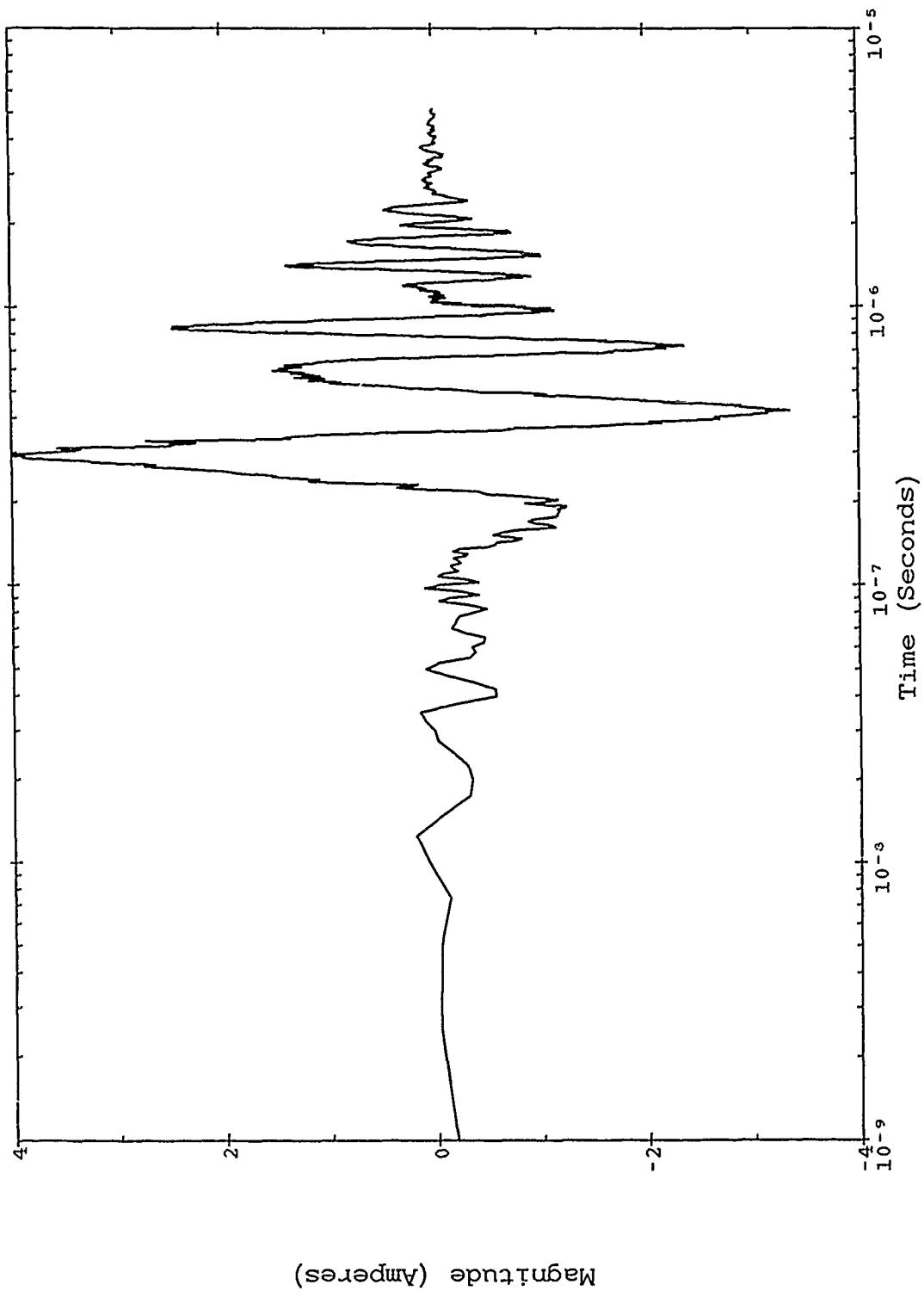


Figure B-60. Double exponential threat; TP 0723 SN 2256.

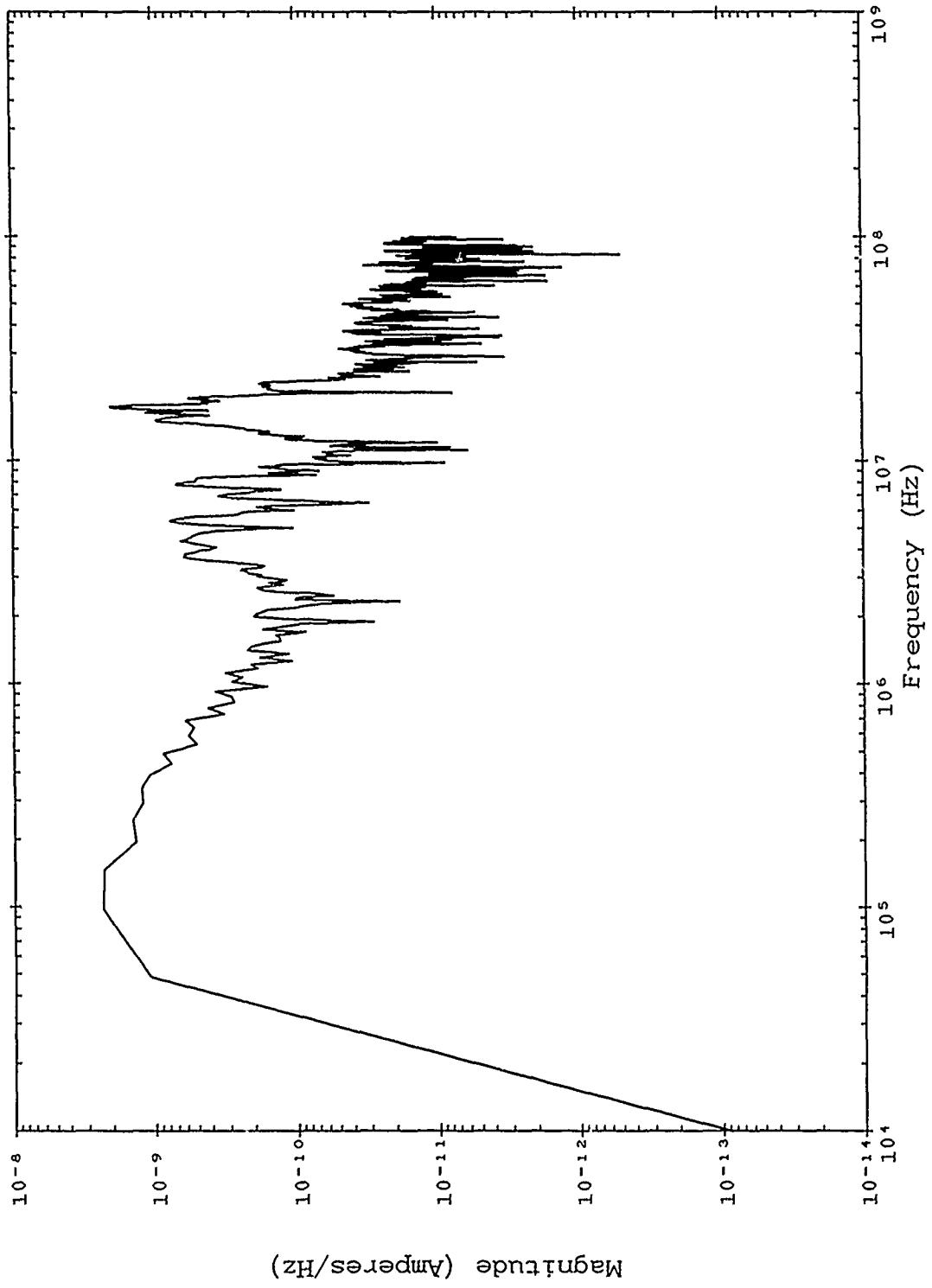


Figure B-61. Corrected TRESTLE data; TP 0903 SN 1428.

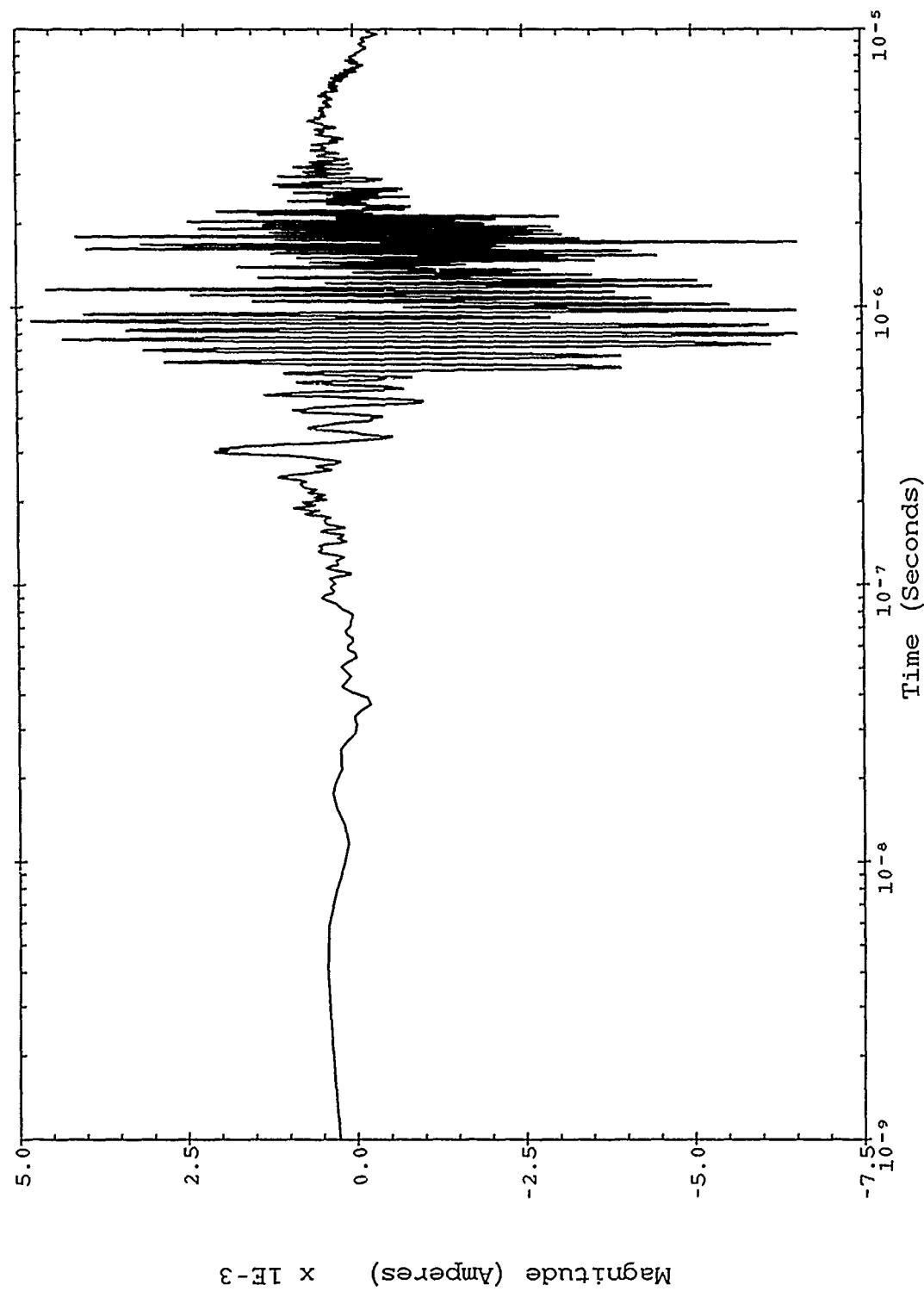


Figure B-62. Corrected TRESTLE data; TP 0903 SN 1428.

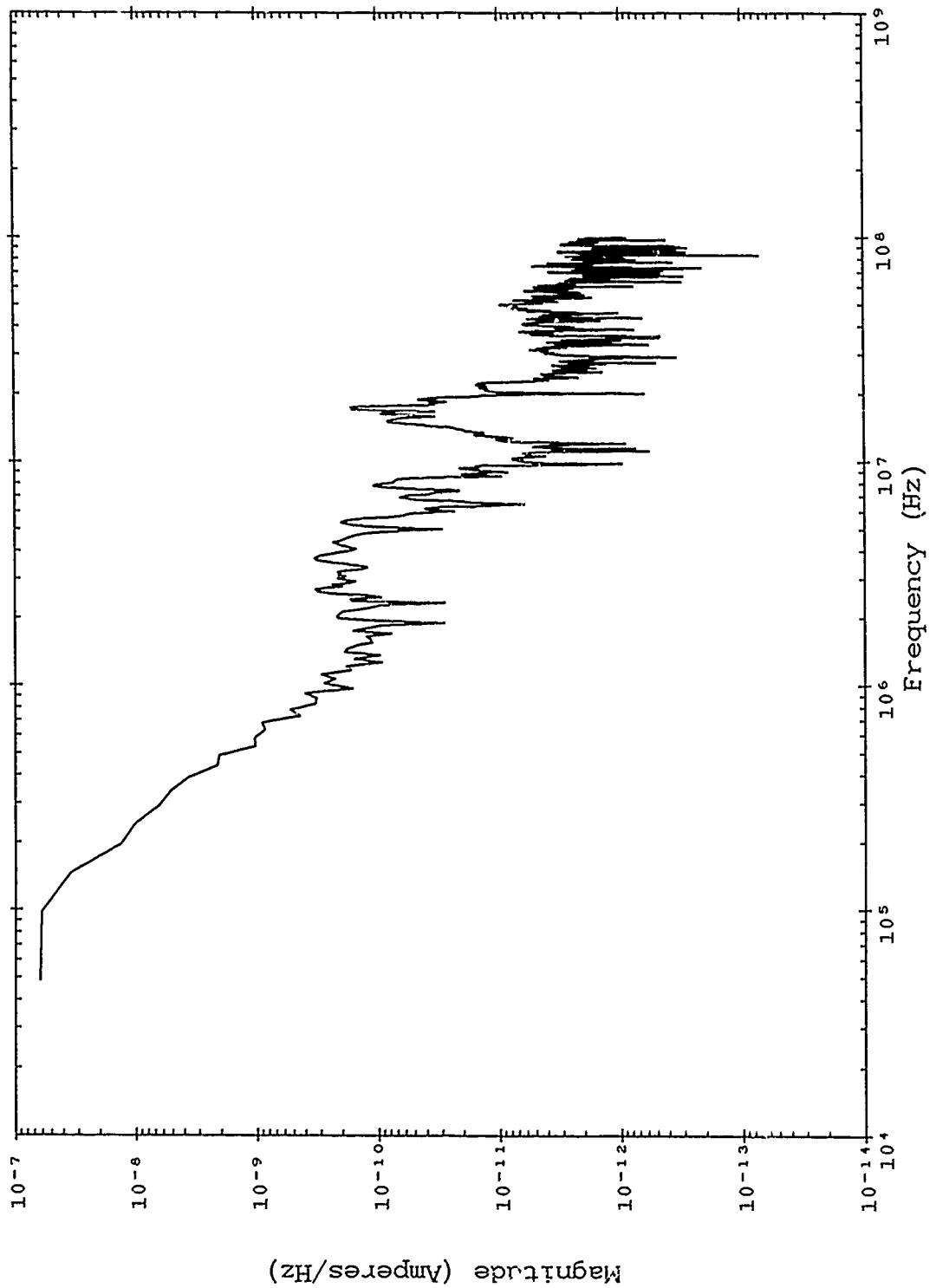


Figure 3-63. Severe nearby lightning threat; TP 0903 SN 1428.

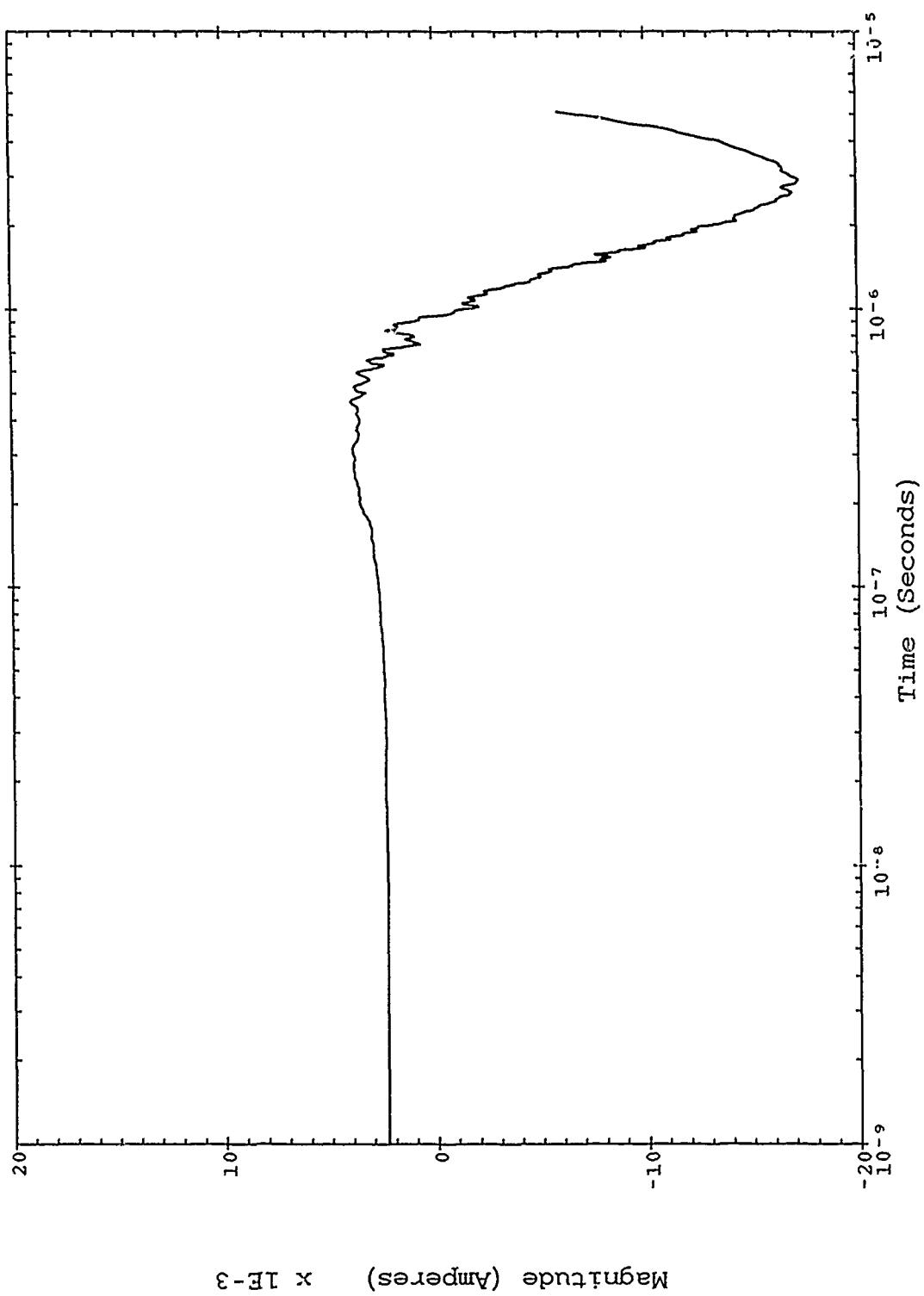


Figure B-64. Severe nearby lightning threat; TP 0903 SN 1428.

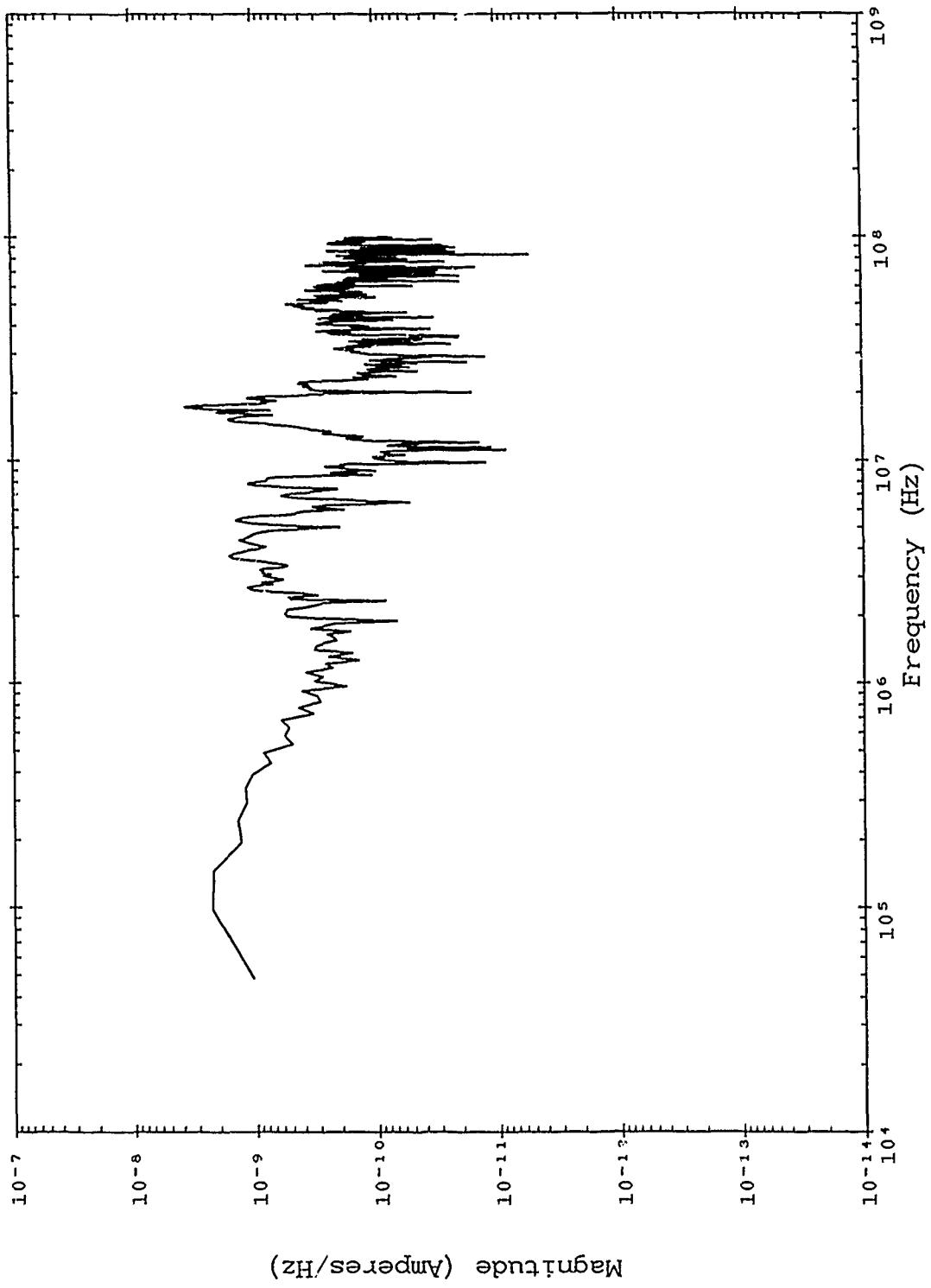


Figure B-65. Double exponential threat; TP 0903 SN 1428.

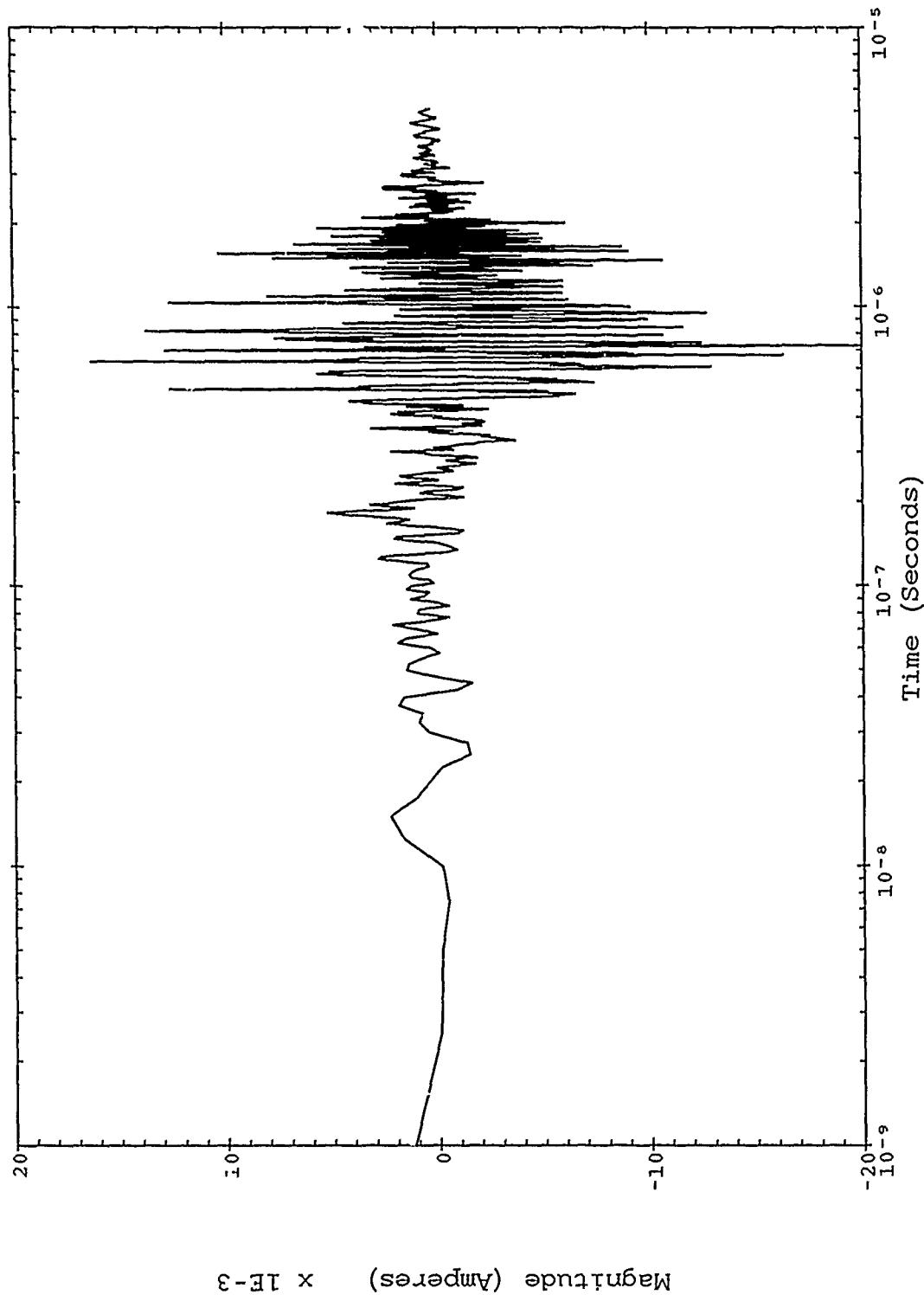


Figure B-66. Double exponential threat; TP 0903 SN 1428.

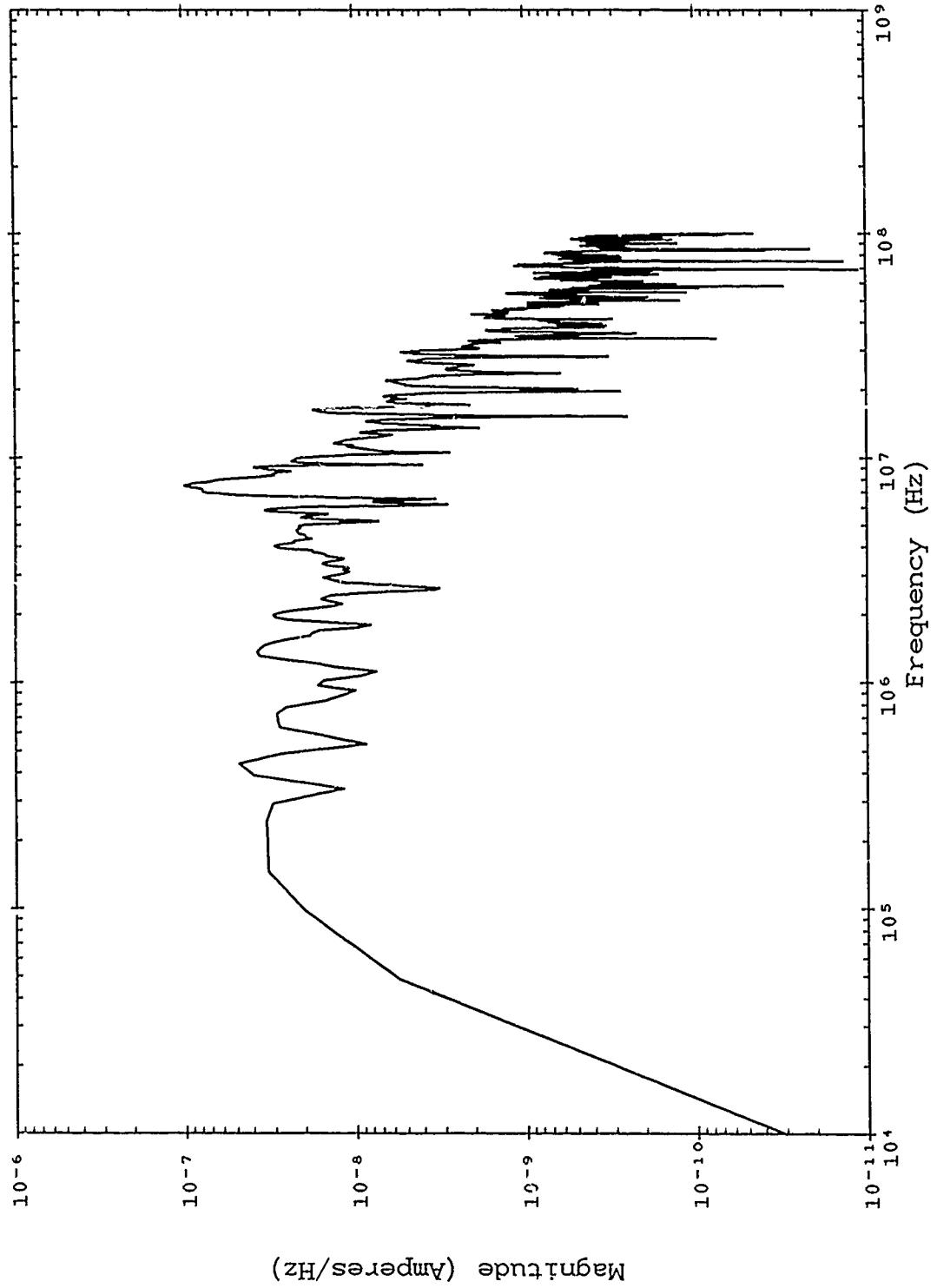


Figure B-57. Corrected TRESTLE data; TP 0918 SN 2550.

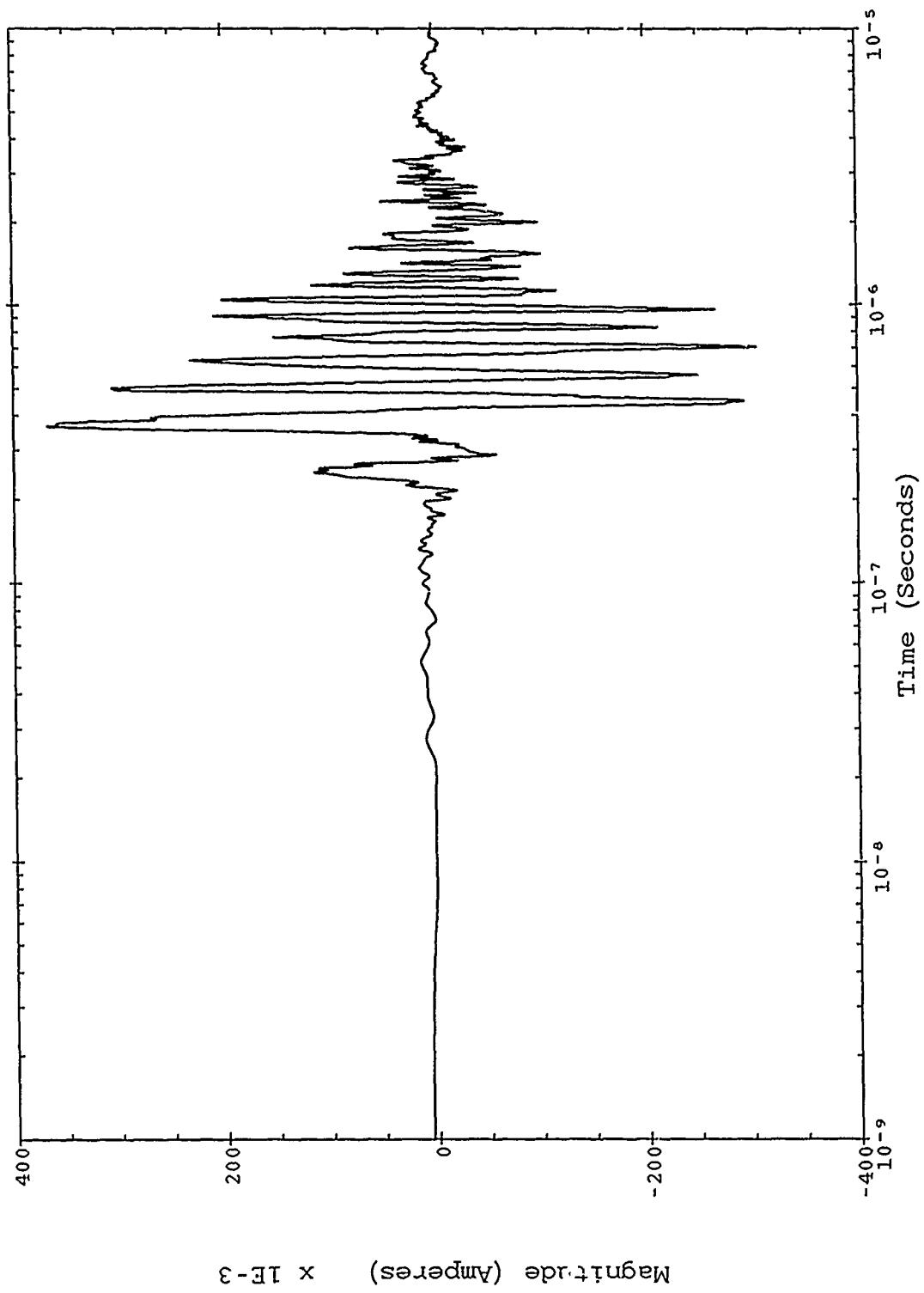


Figure B-68. Corrected TRESTLE data; TP 0918 SN 2550.

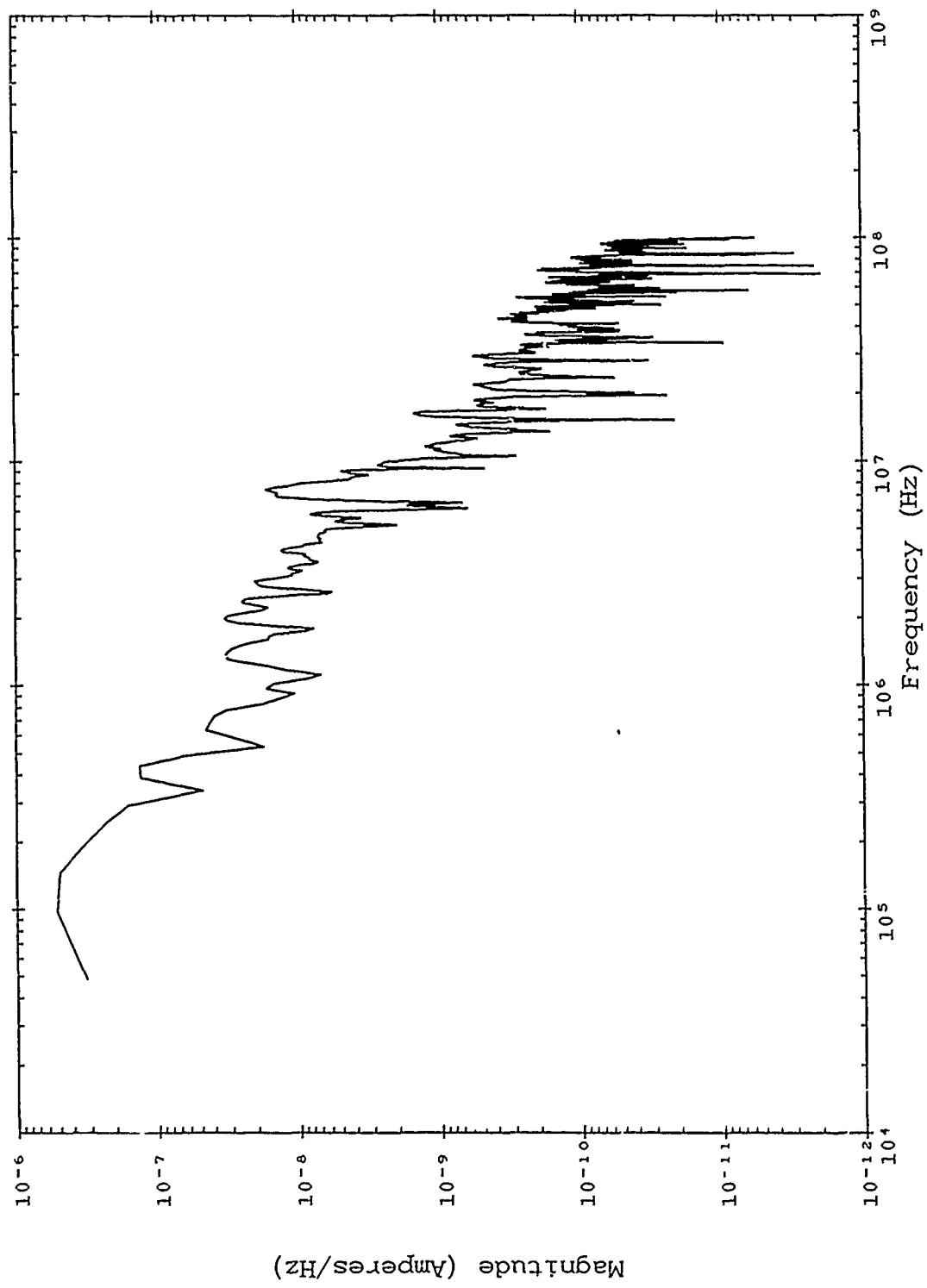


Figure B-69. Severe nearby lightning threat; TP 0918 SN 2550.

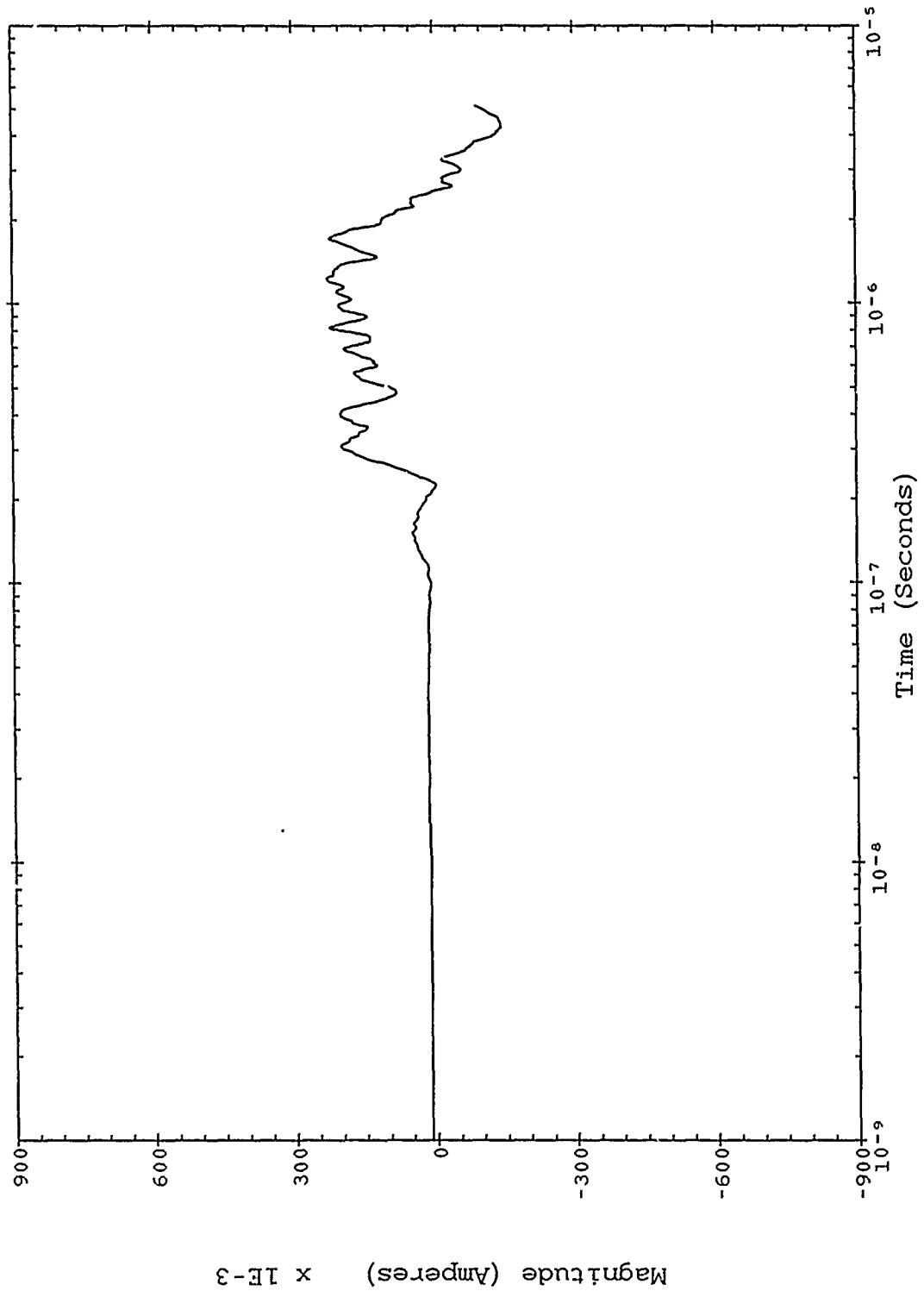


Figure B-70. Severe nearby lightning threat; TP 0918 SN 2550.

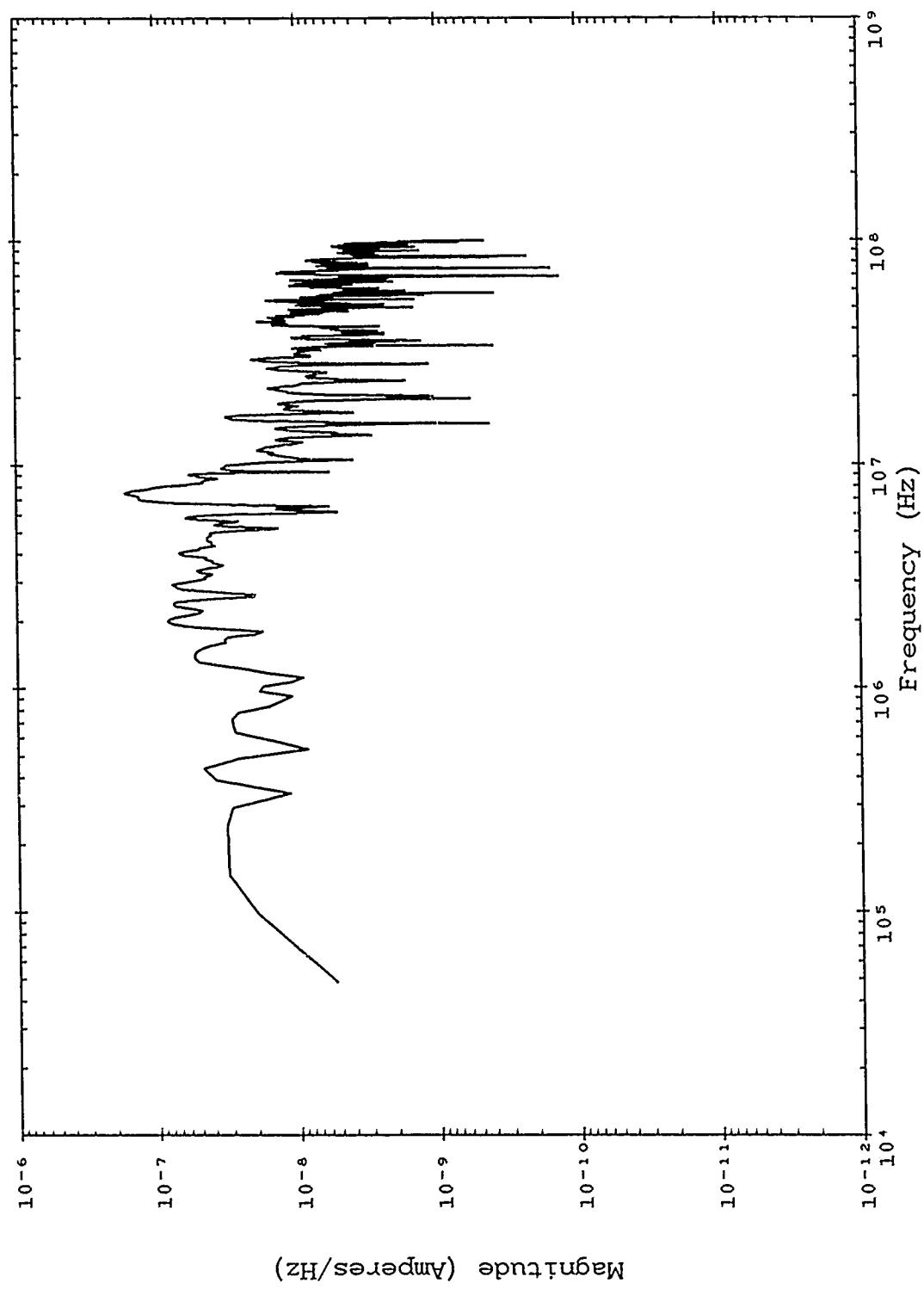


Figure B-71. Double exponential threat; TP 0918 SN 2550.

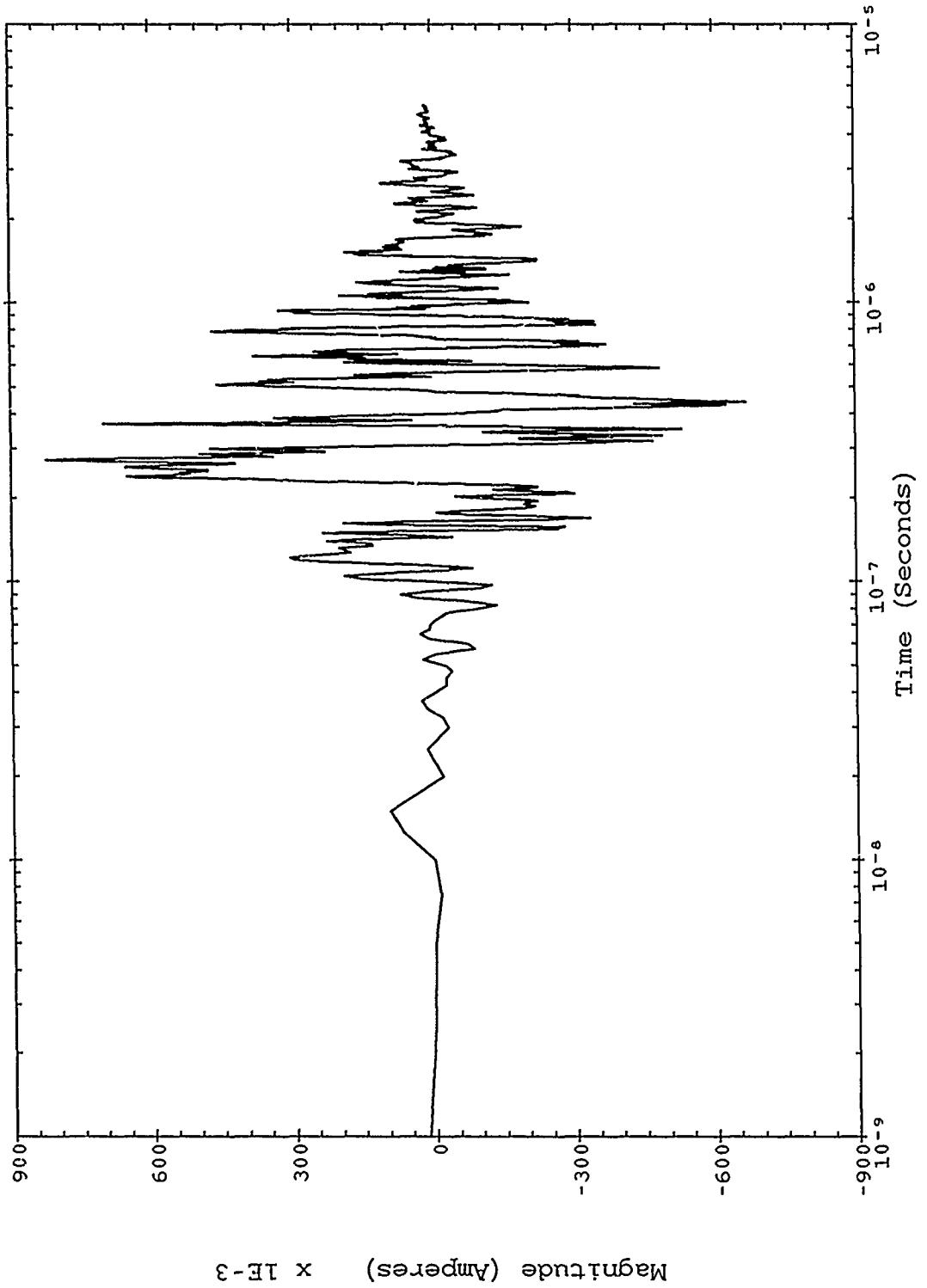


Figure B-72. Double exponential threat; TP 0918 SN 2550.

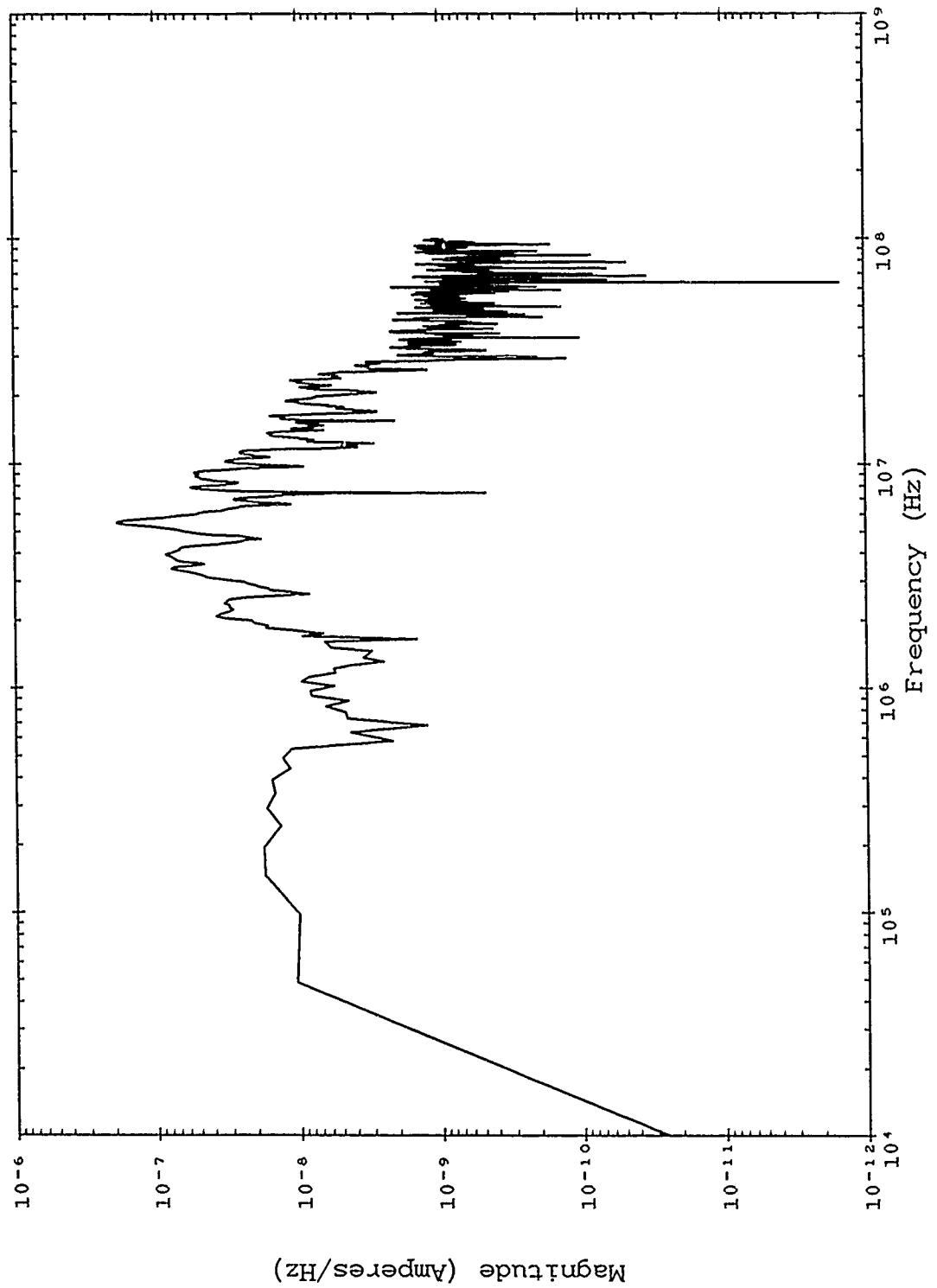


Figure B-73. Corrected TRESTLE data; TP 1182 SN 1159.

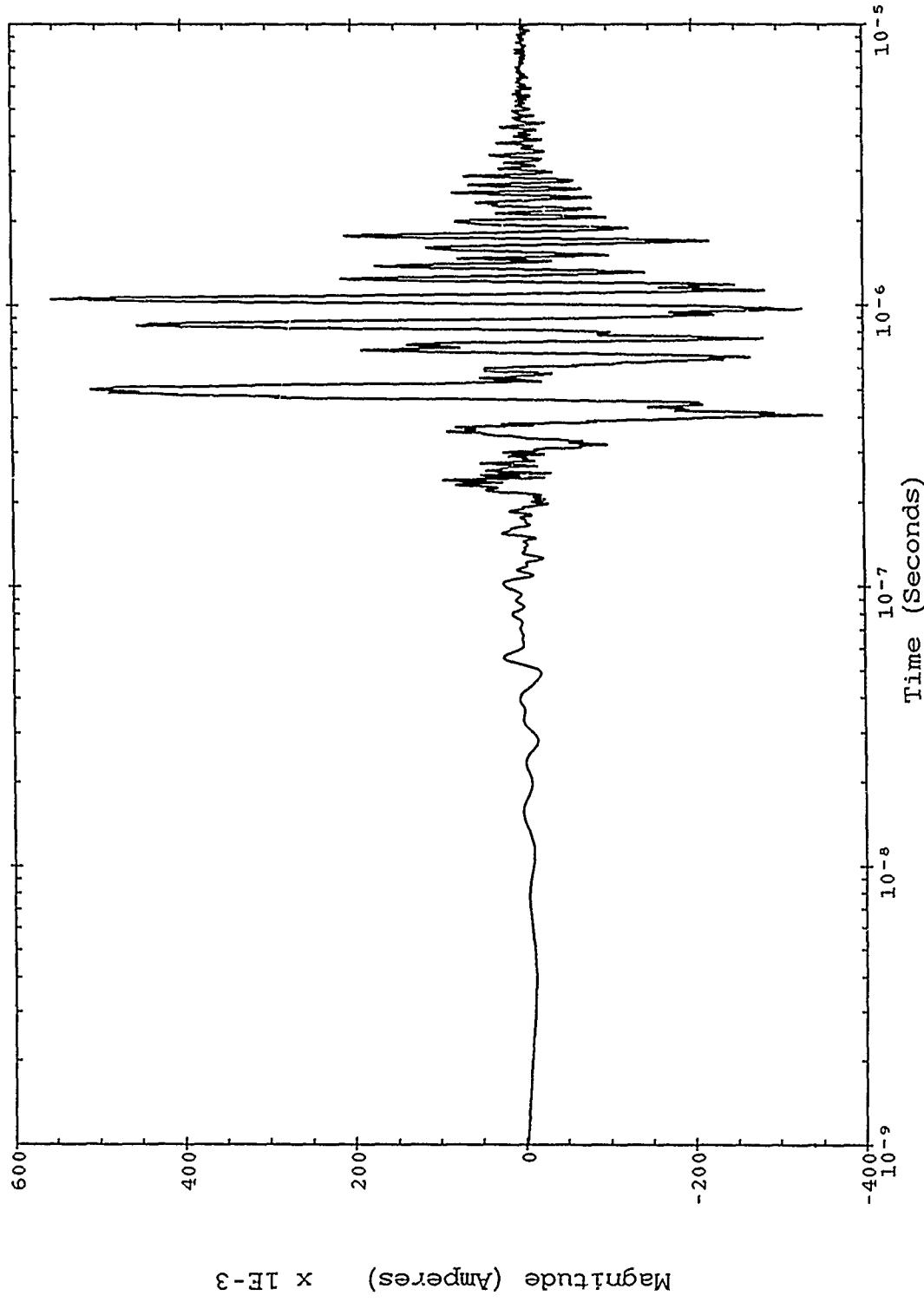


Figure B-74. Corrected TRESTLE data; TP 1182 SN 1159.

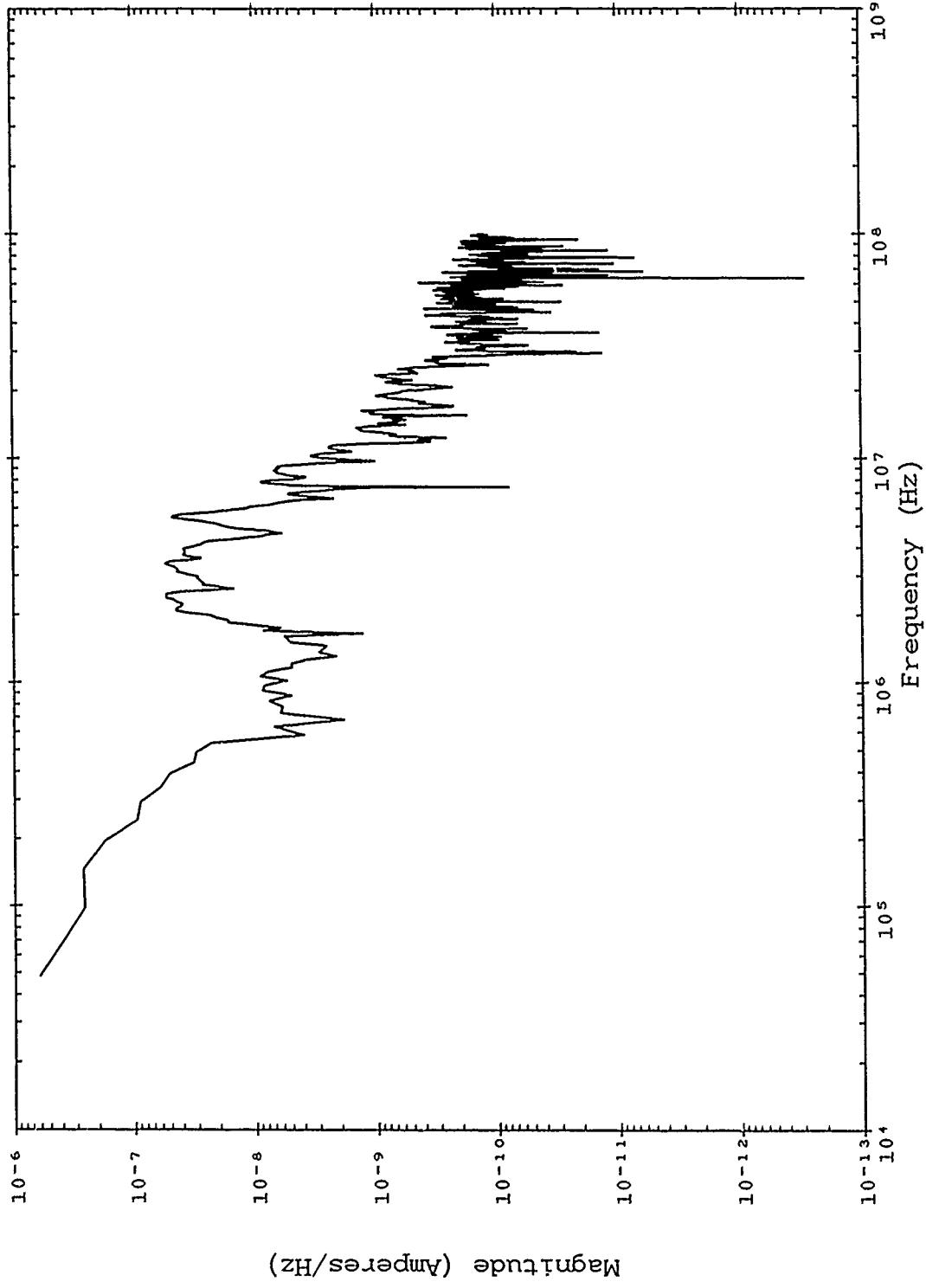


Figure B-75. Severe nearby lightning threat; TP 1182 SN 1159.

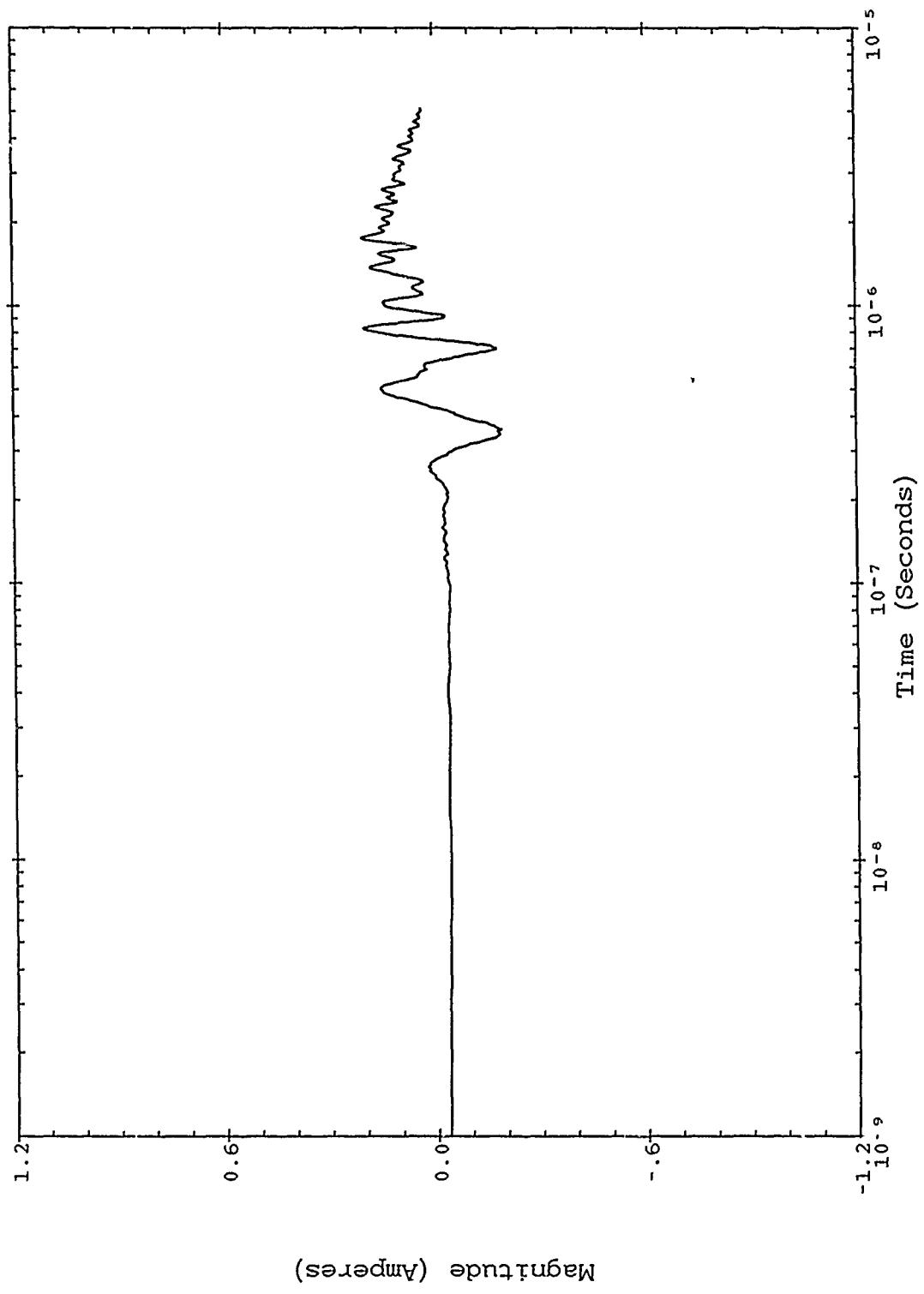


Figure B-76. Severe nearby lightning threat; TP 1182 SN 1159.

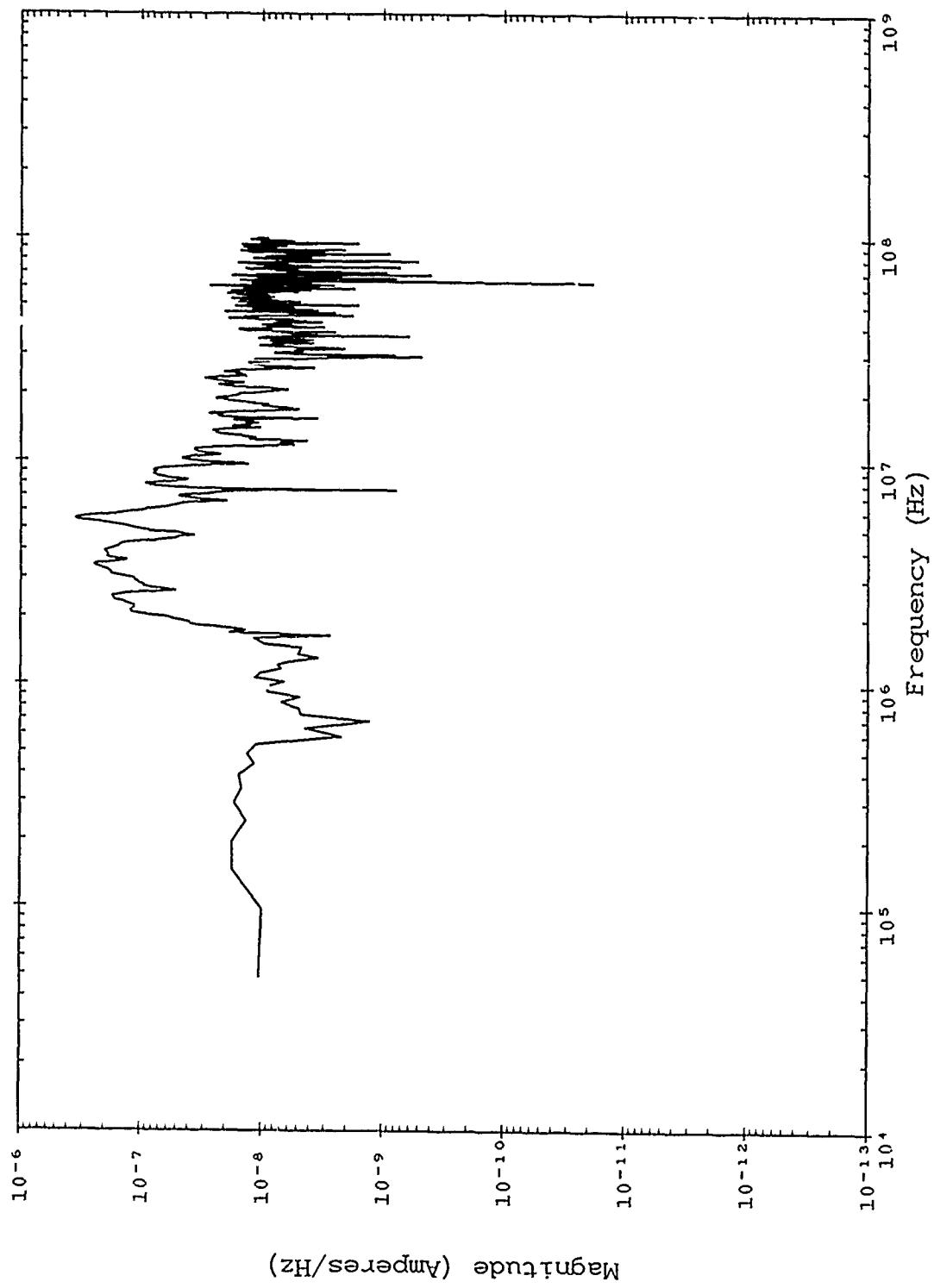


Figure B-77. Double exponential threat; TP 1182 SN 1159.

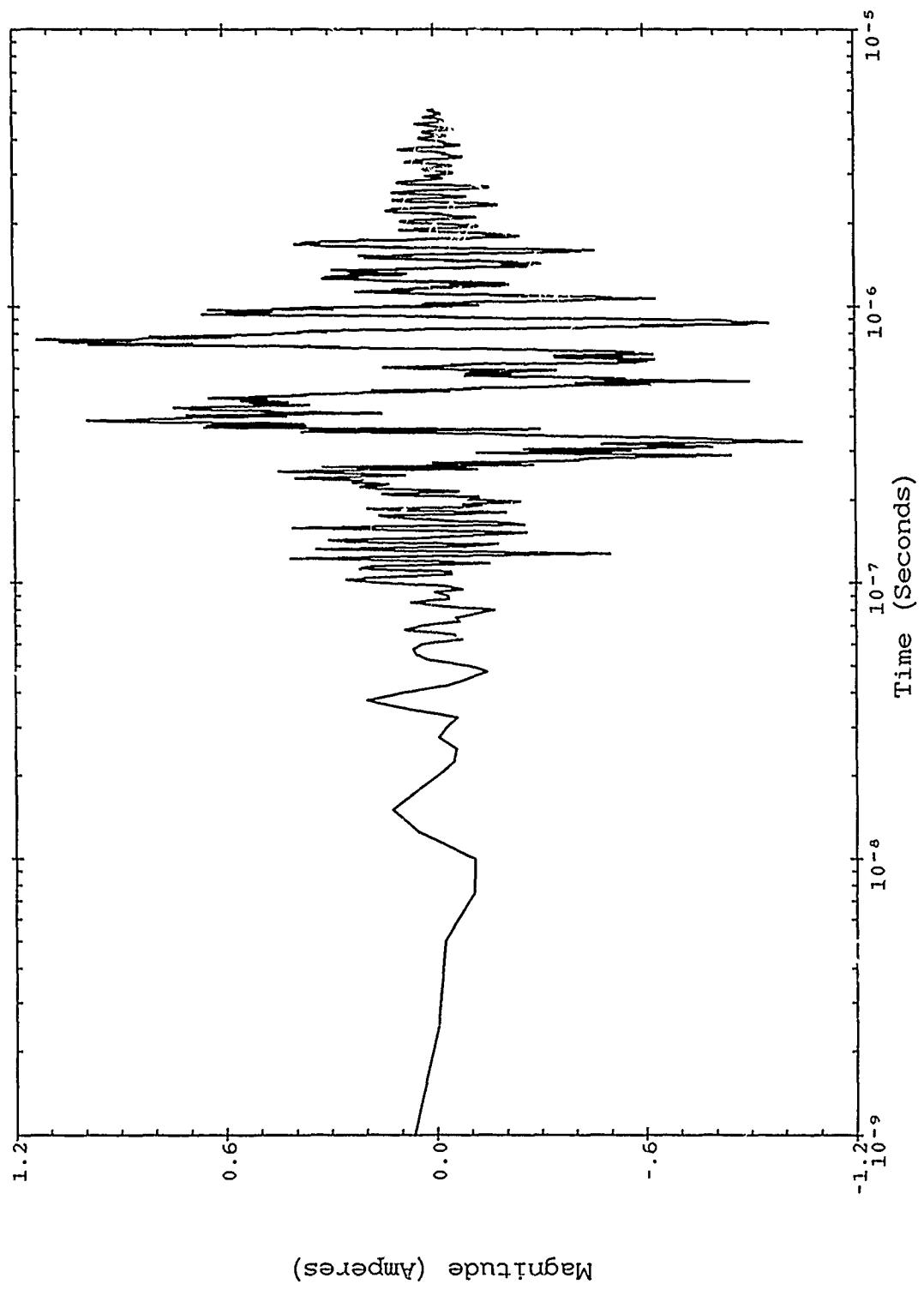


Figure B-78. Double exponential threat; TP 1182 SN 1159.

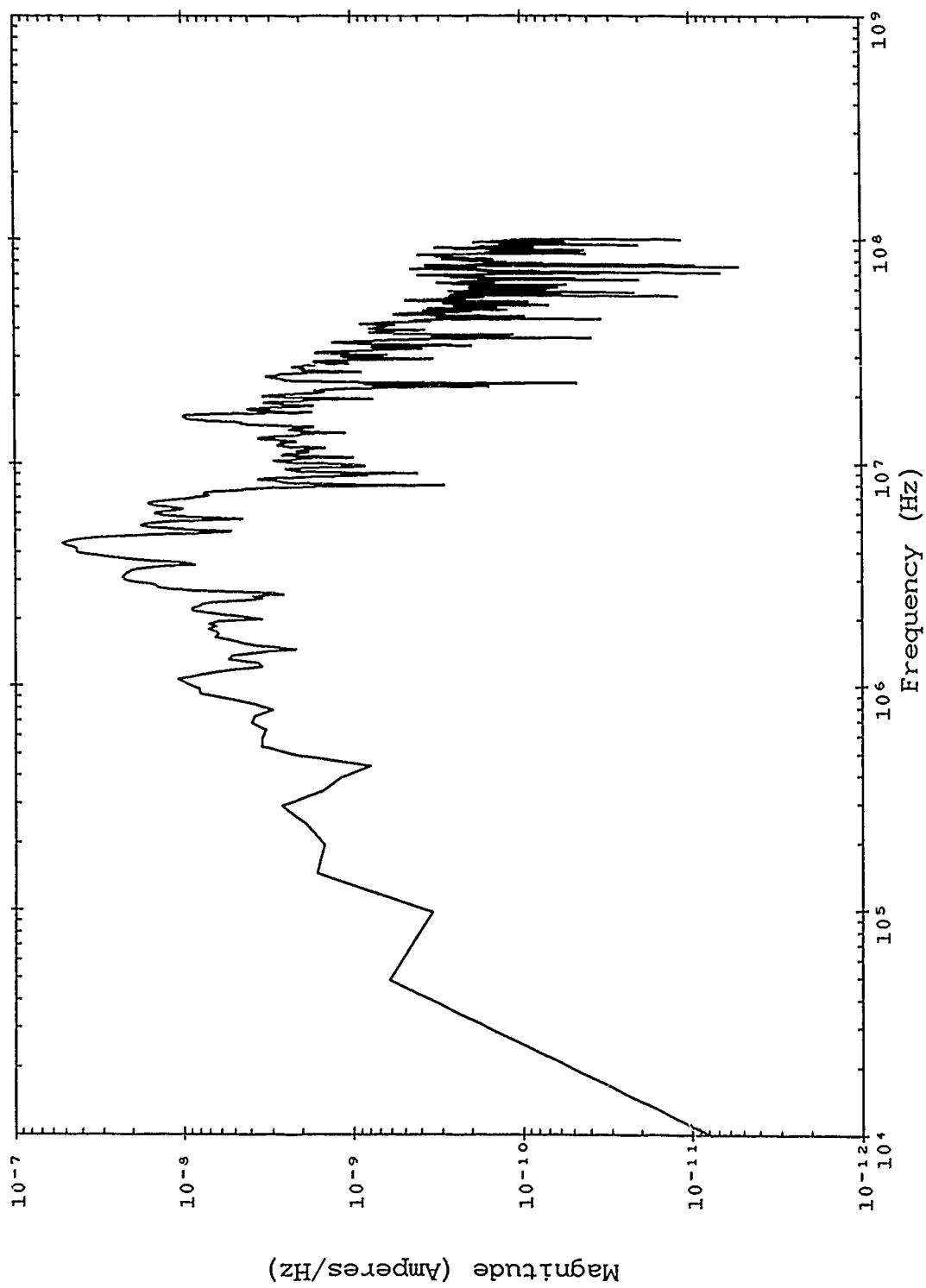


Figure B-79. Corrected TRESTLE data; TP 1473 SN 1779.

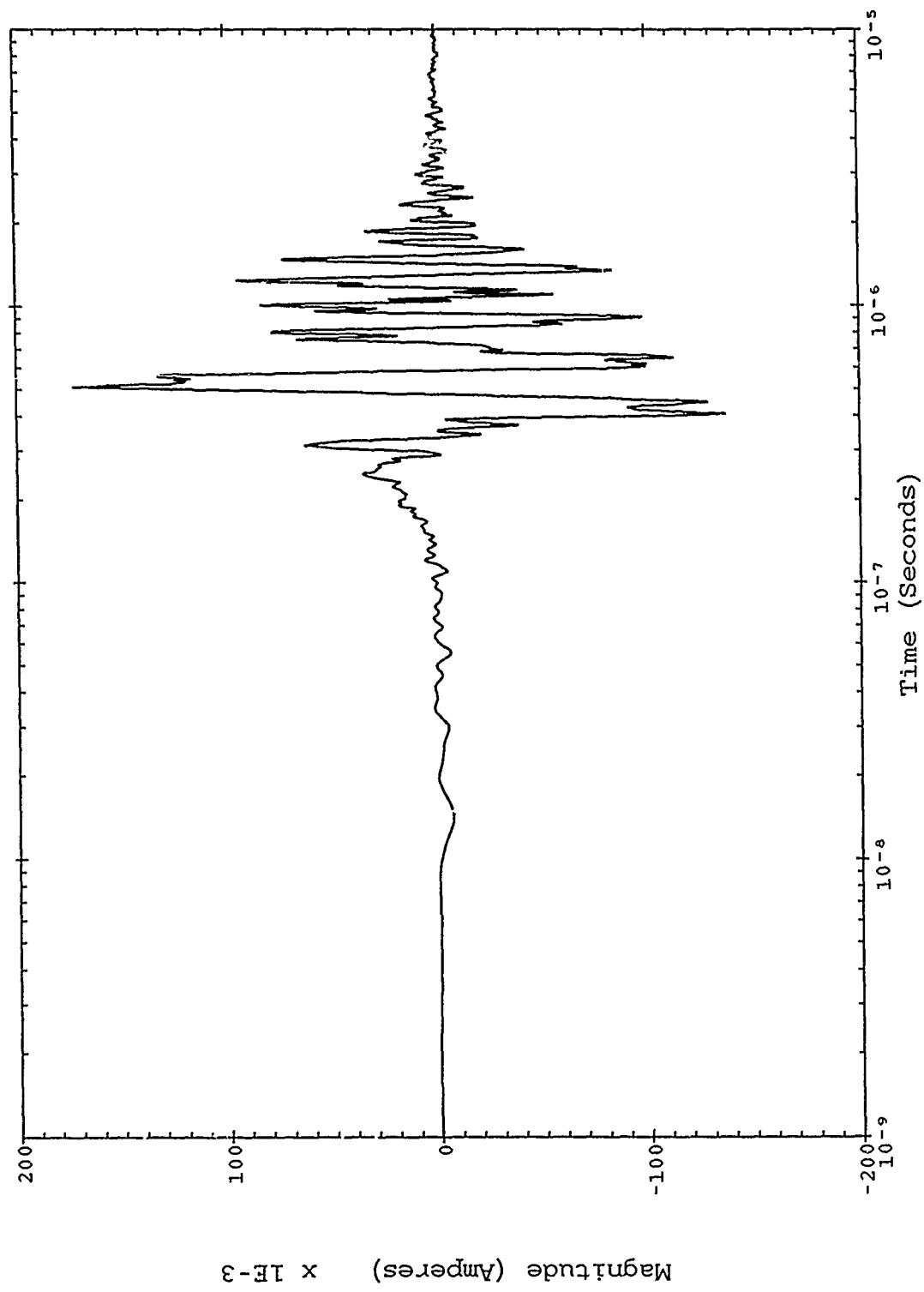


Figure B-80. Corrected TRESTLE data; TP 1473 SN 1779.

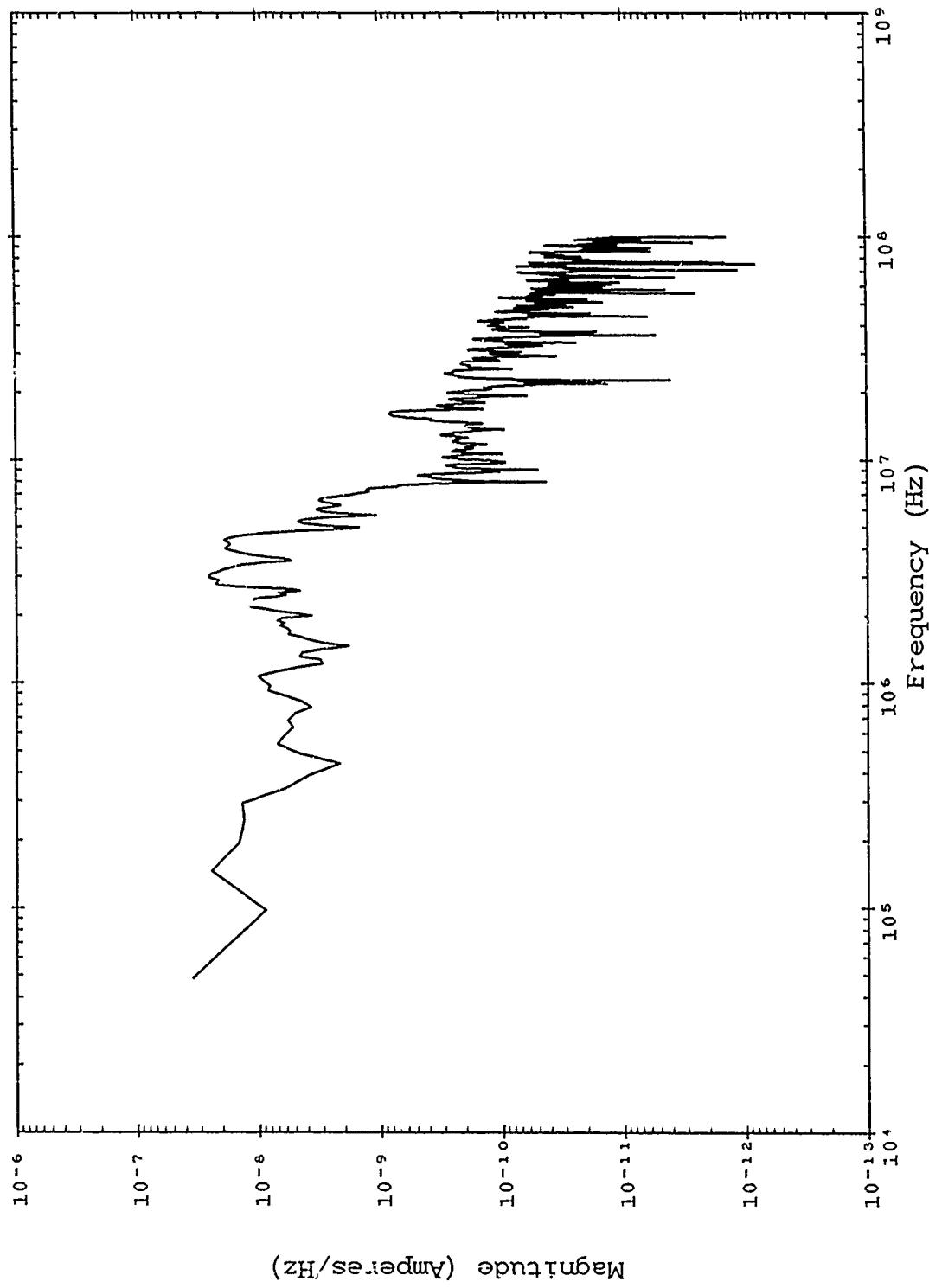


Figure B-81. Severe nearby lightning threat; TP 1473 SN 1779.

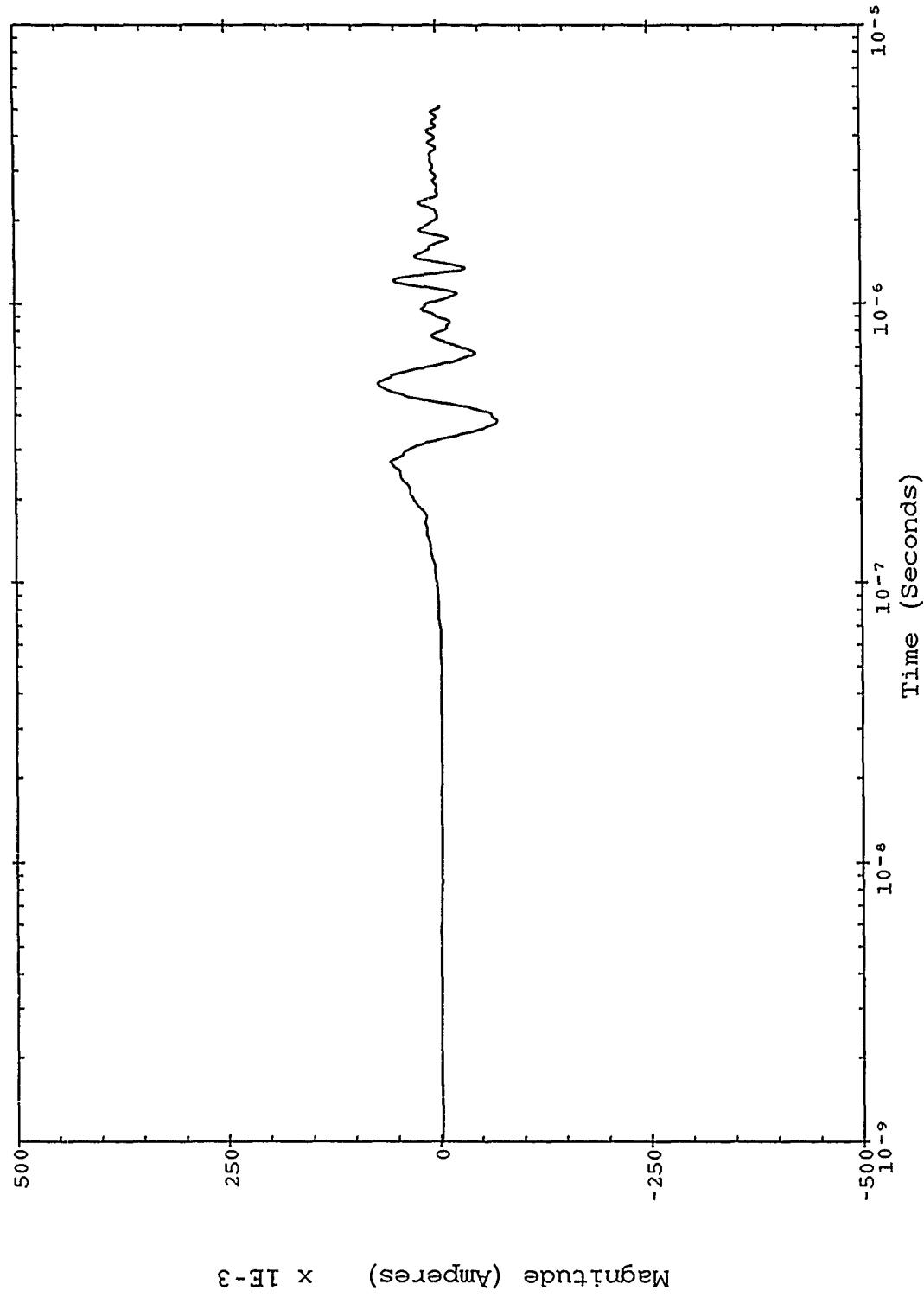


Figure B-82. Severe nearby lightning threat; TP 1473 SN 1779.

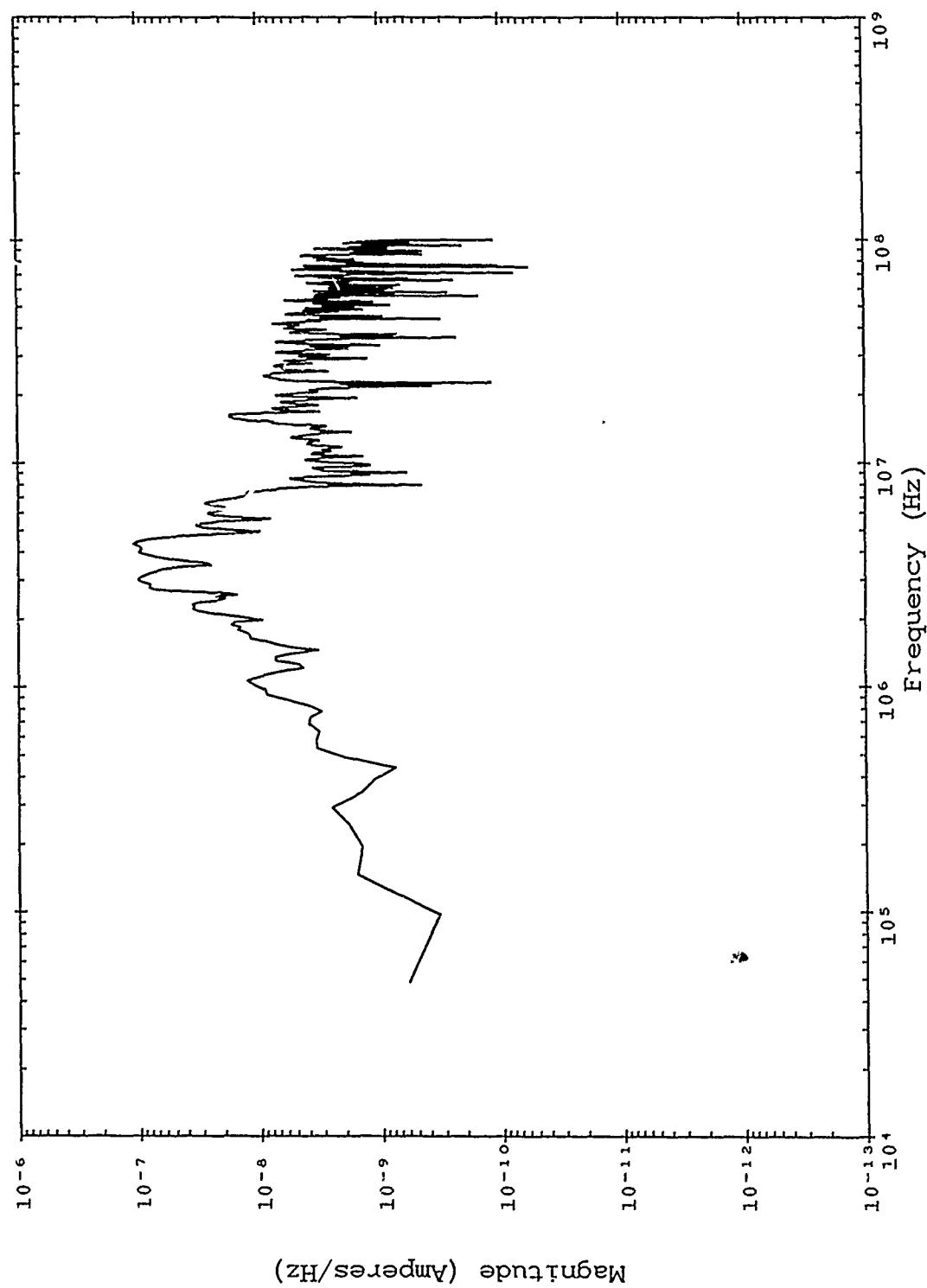


Figure B-83. Double exponential threat; TP 1473 SN 1779.

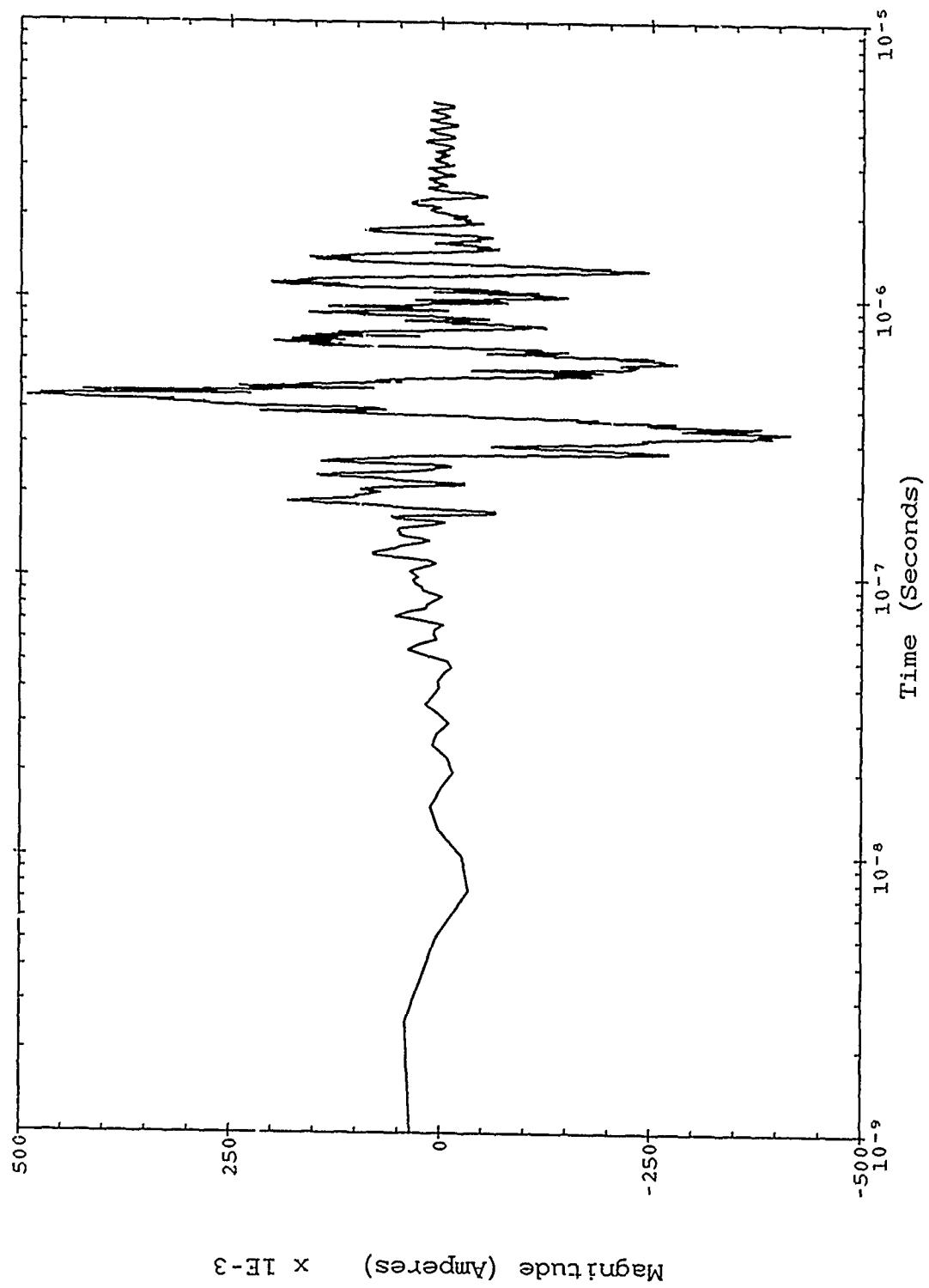


Figure B-84. Double exponential threat; TP 1473 SN 1779.

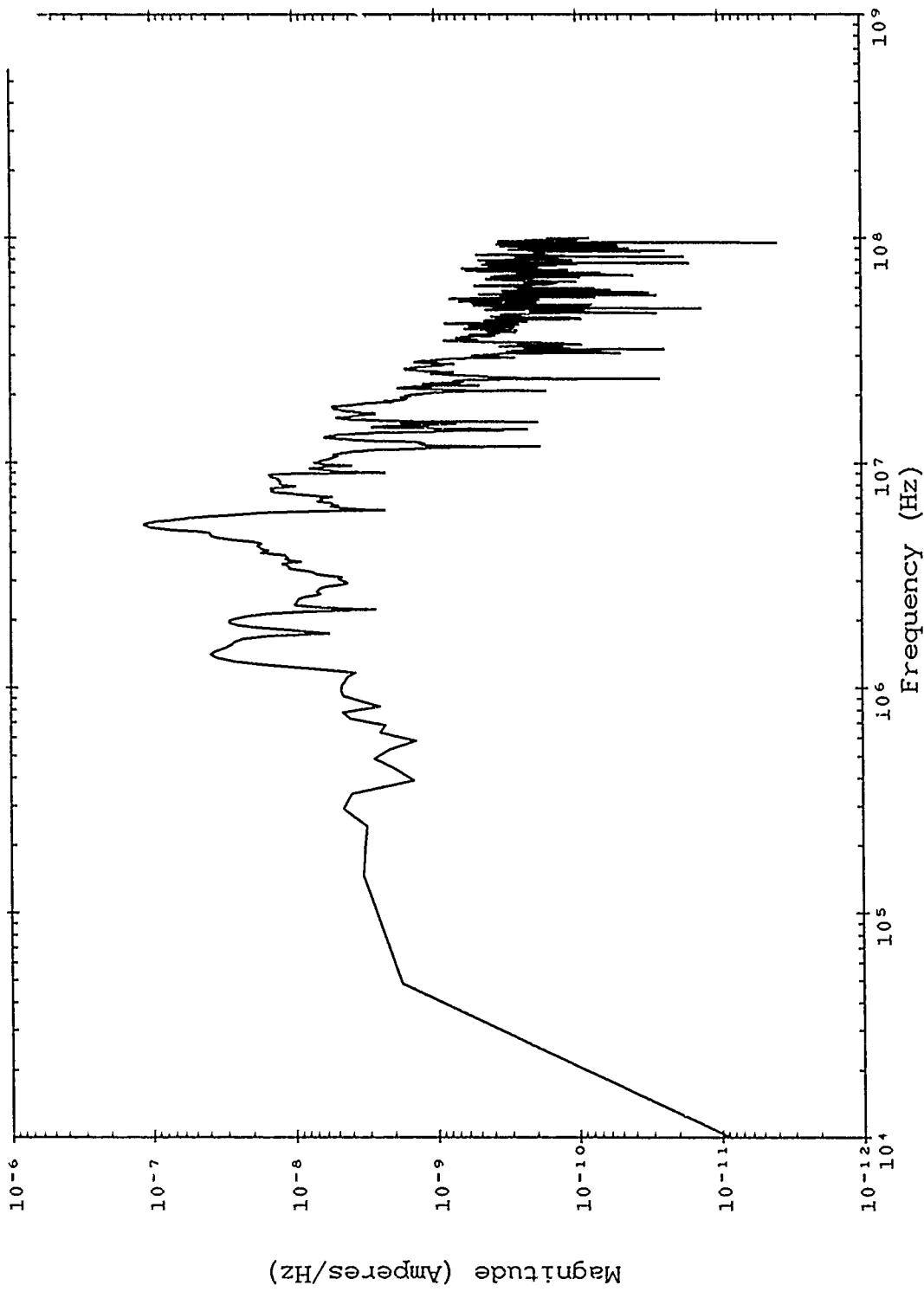


Figure B-85. Corrected TRESTLE data; TP 1660 SN 2545.

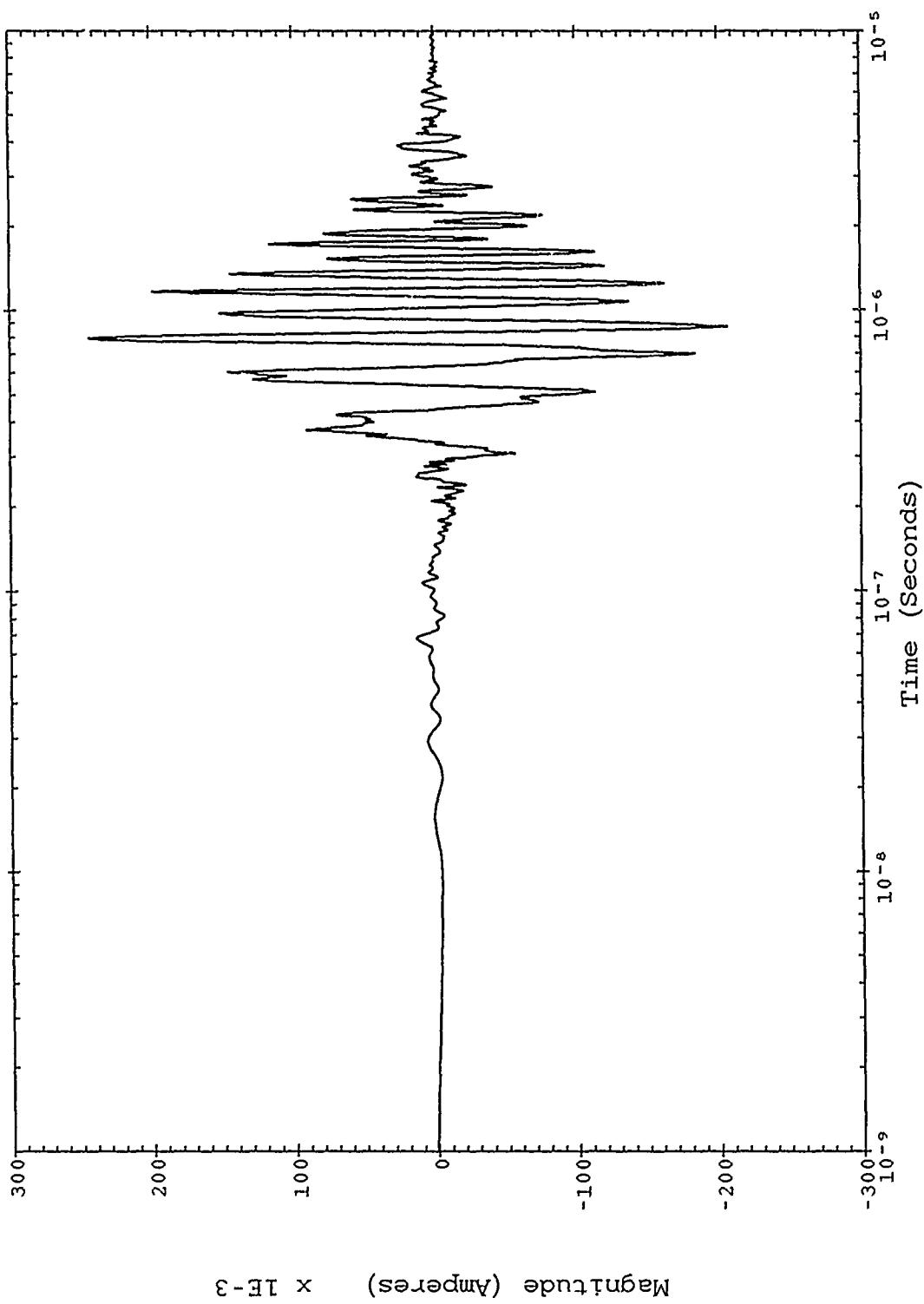


Figure B-86. Corrected TRESTLE data; TP 1660 SN 2545.

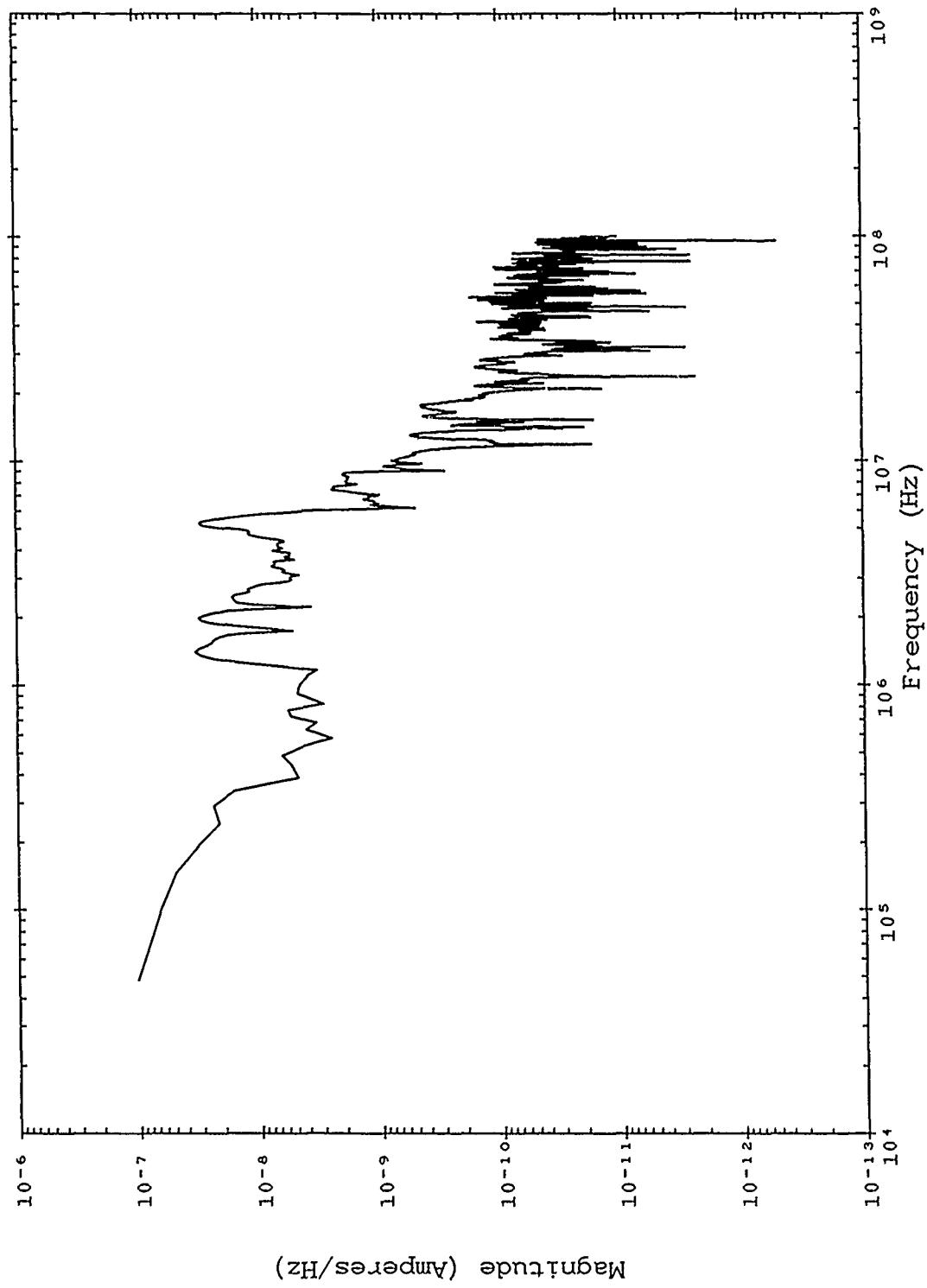


Figure B-87. Severe nearby lightning threat; TP 1660 SN 2545.

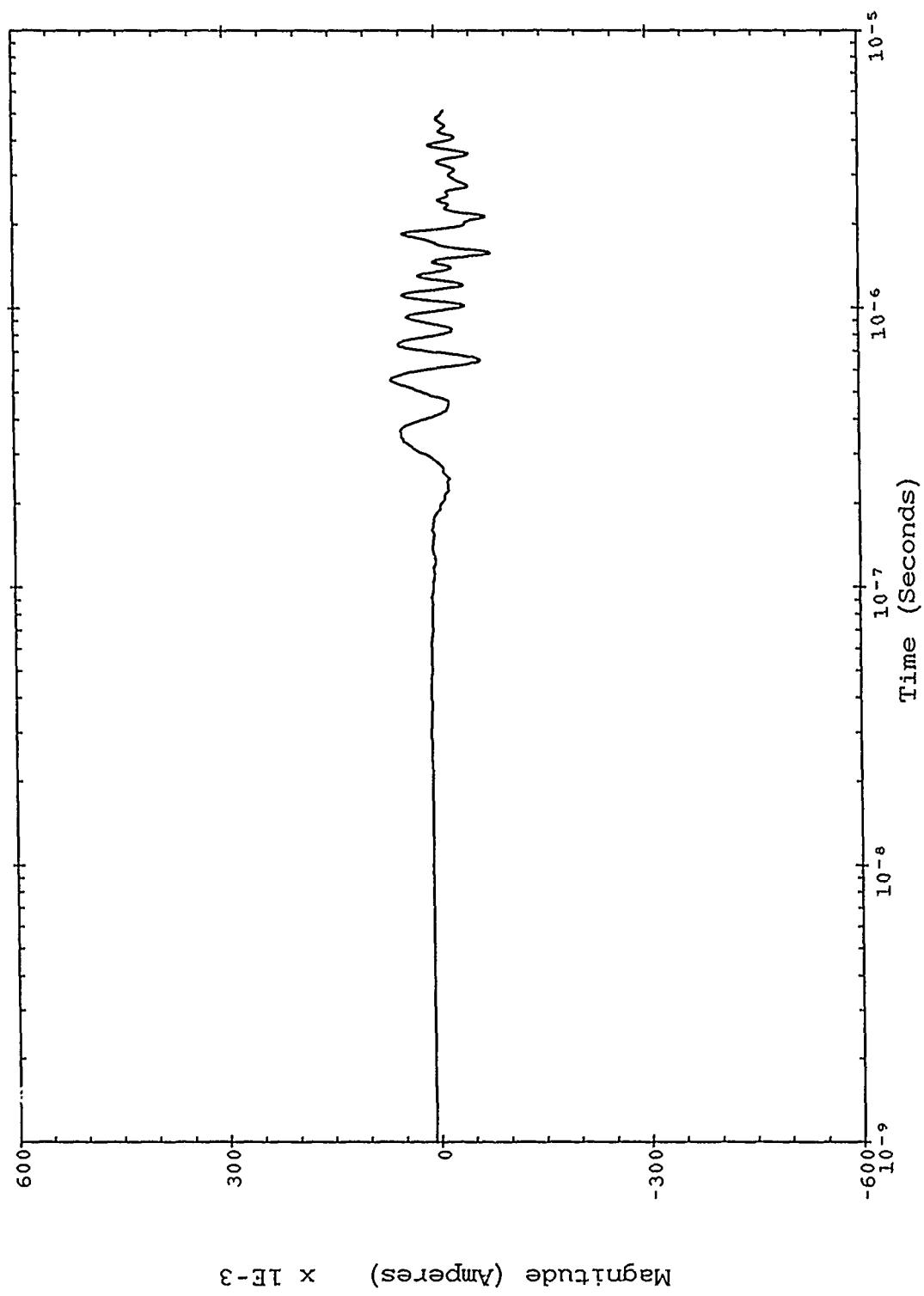


Figure B-88. Severe nearby lightning threat; TP 1660 SN 2545.

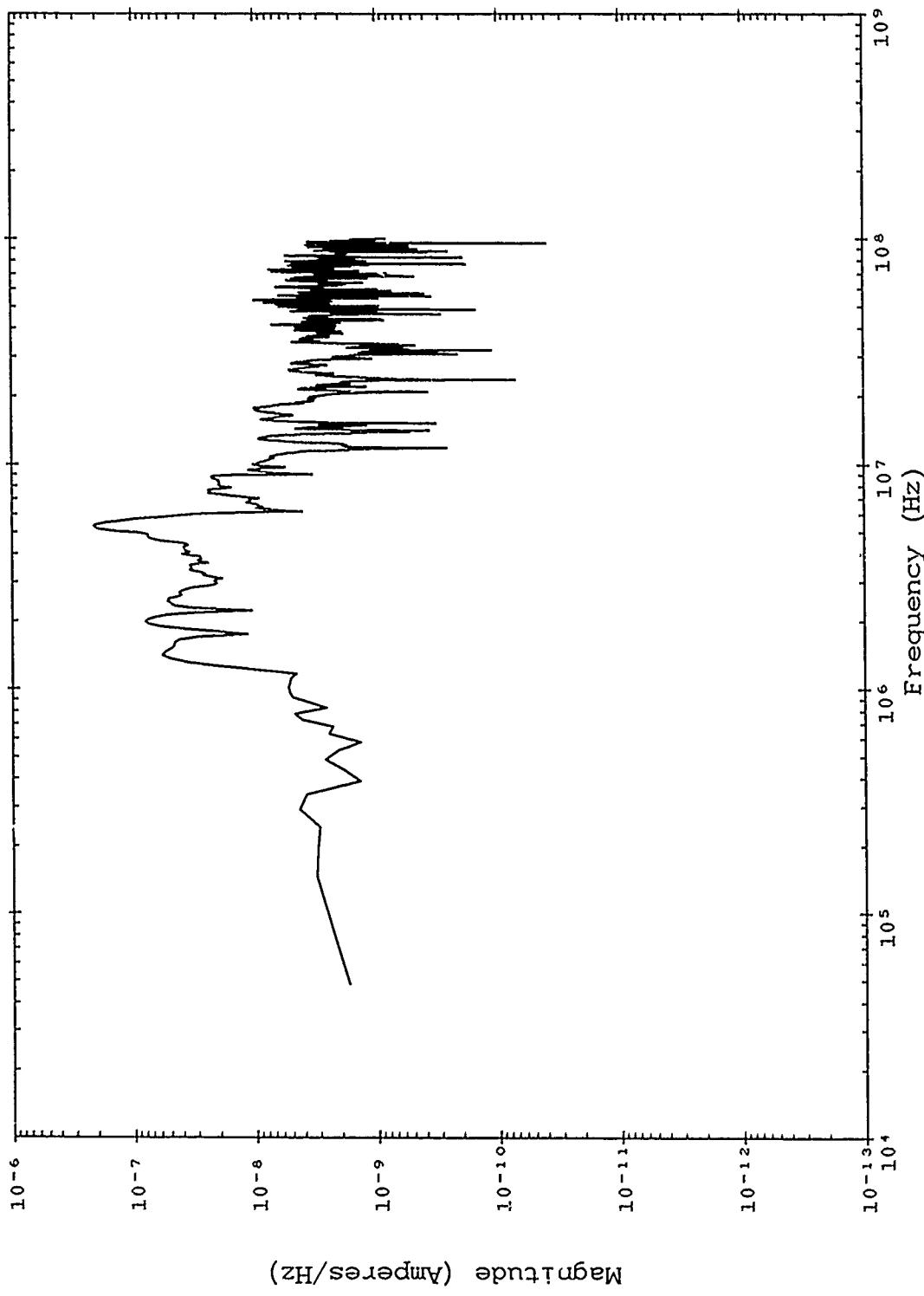


Figure B-89. Double exponential threat; TP 1660 SN 2545.

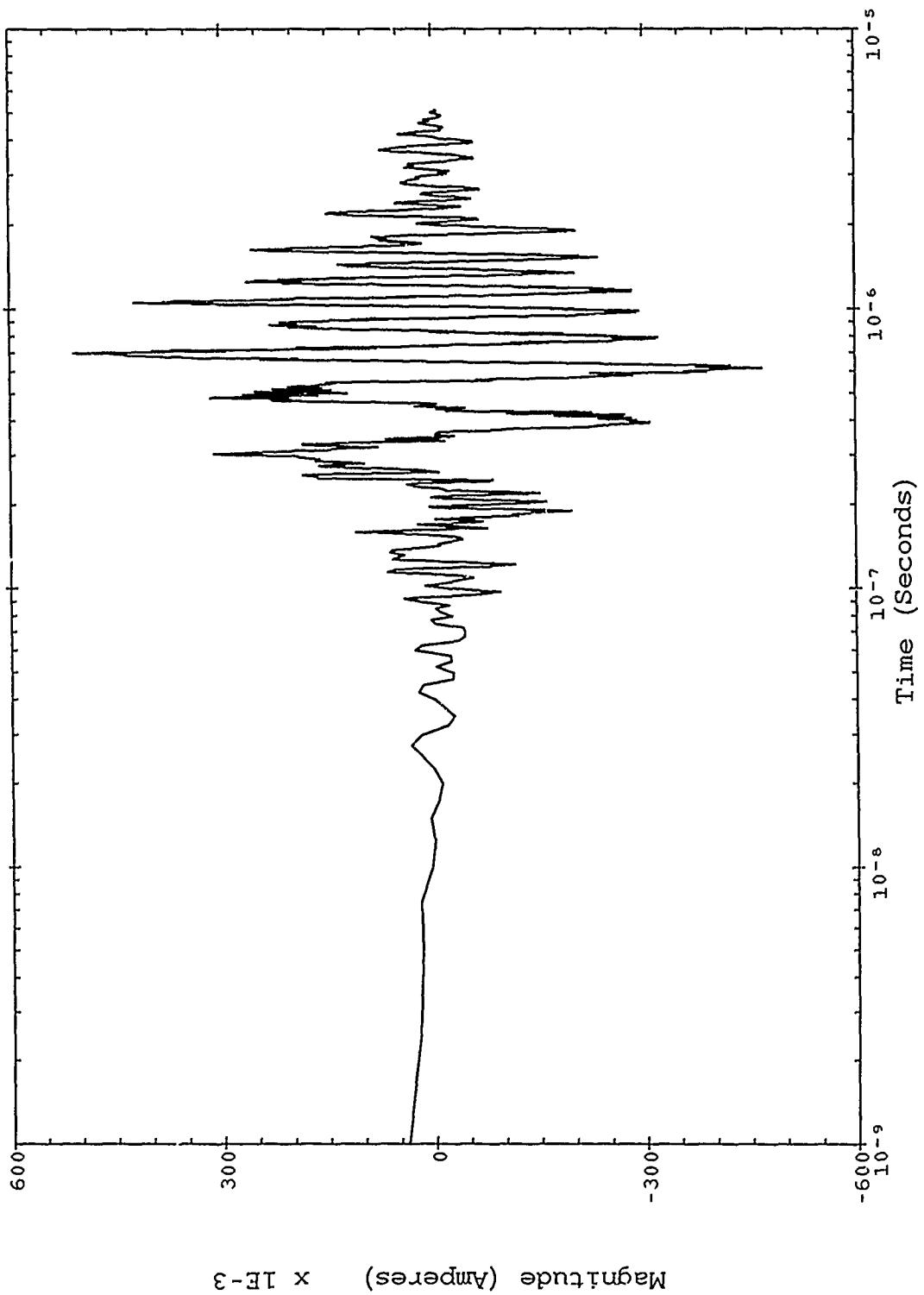


Figure B-90. Double exponential threat; TP 1660 SN 2545.

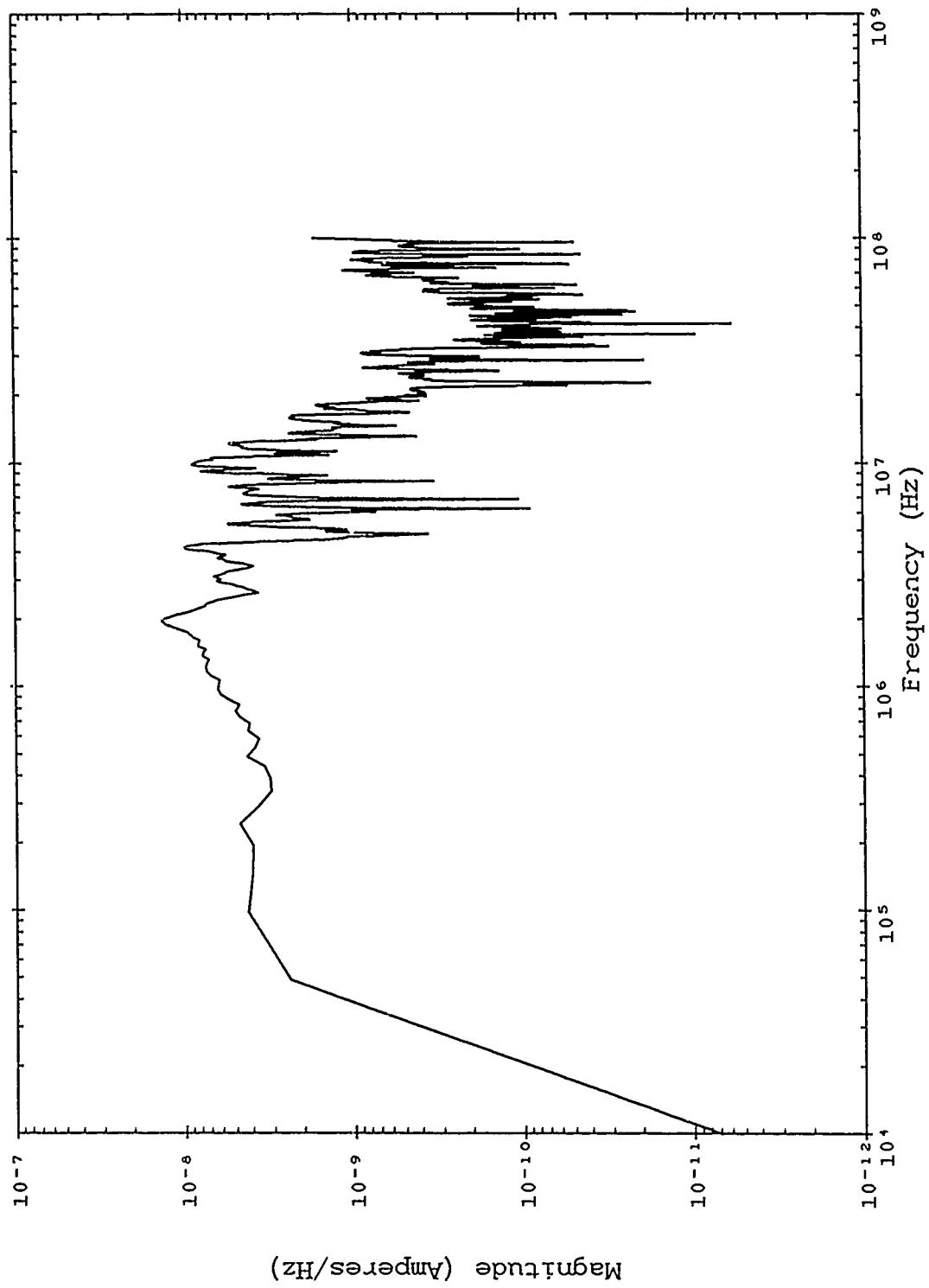


Figure B-91. Corrected TRESTLE data; TP 2238 SN 2154.

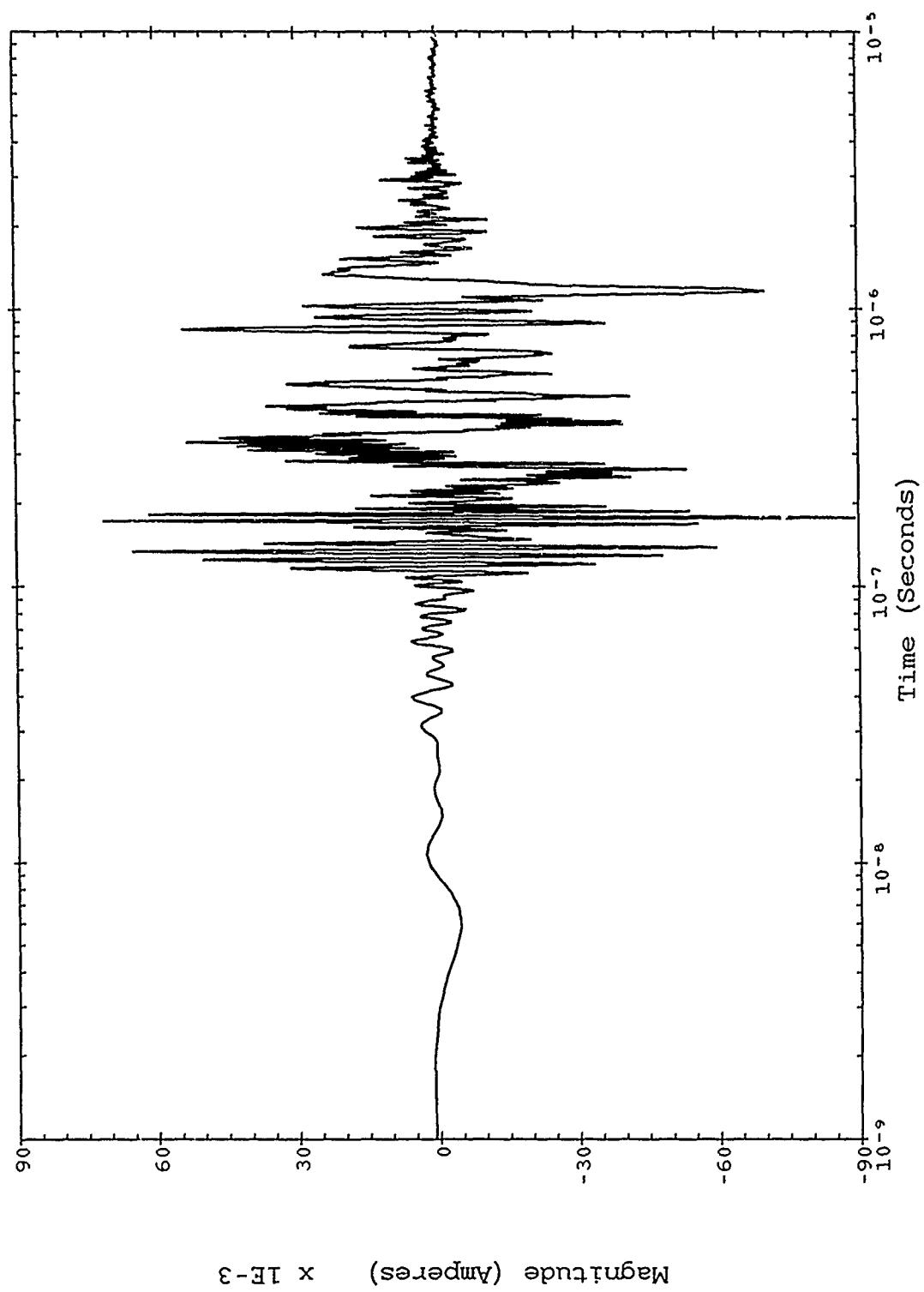


Figure B-92. Corrected TRESTLE data; TP 2238 SN 2154.

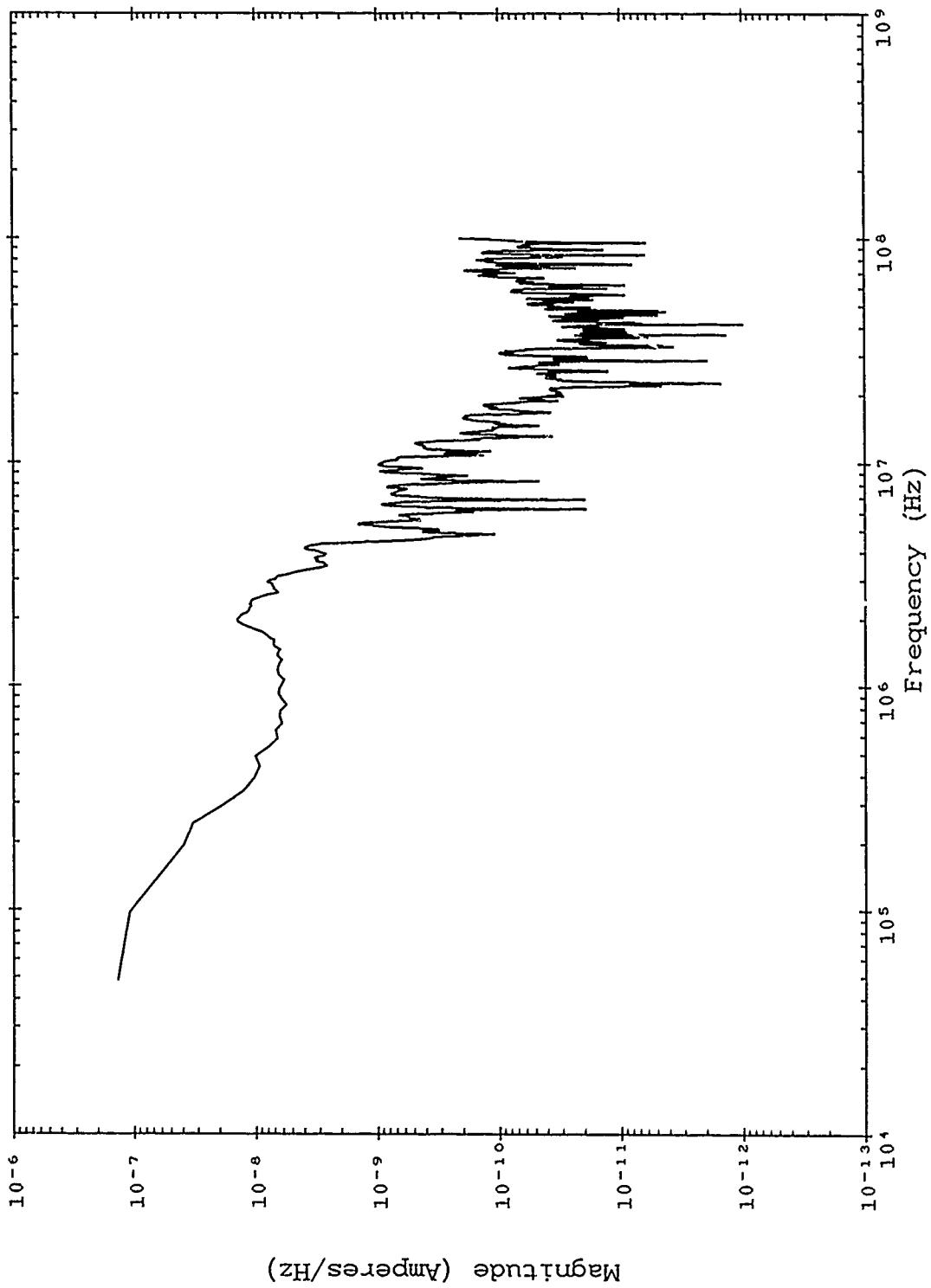


Figure B-93. Severe nearby lightning threat; TP 2238 SN 2154.

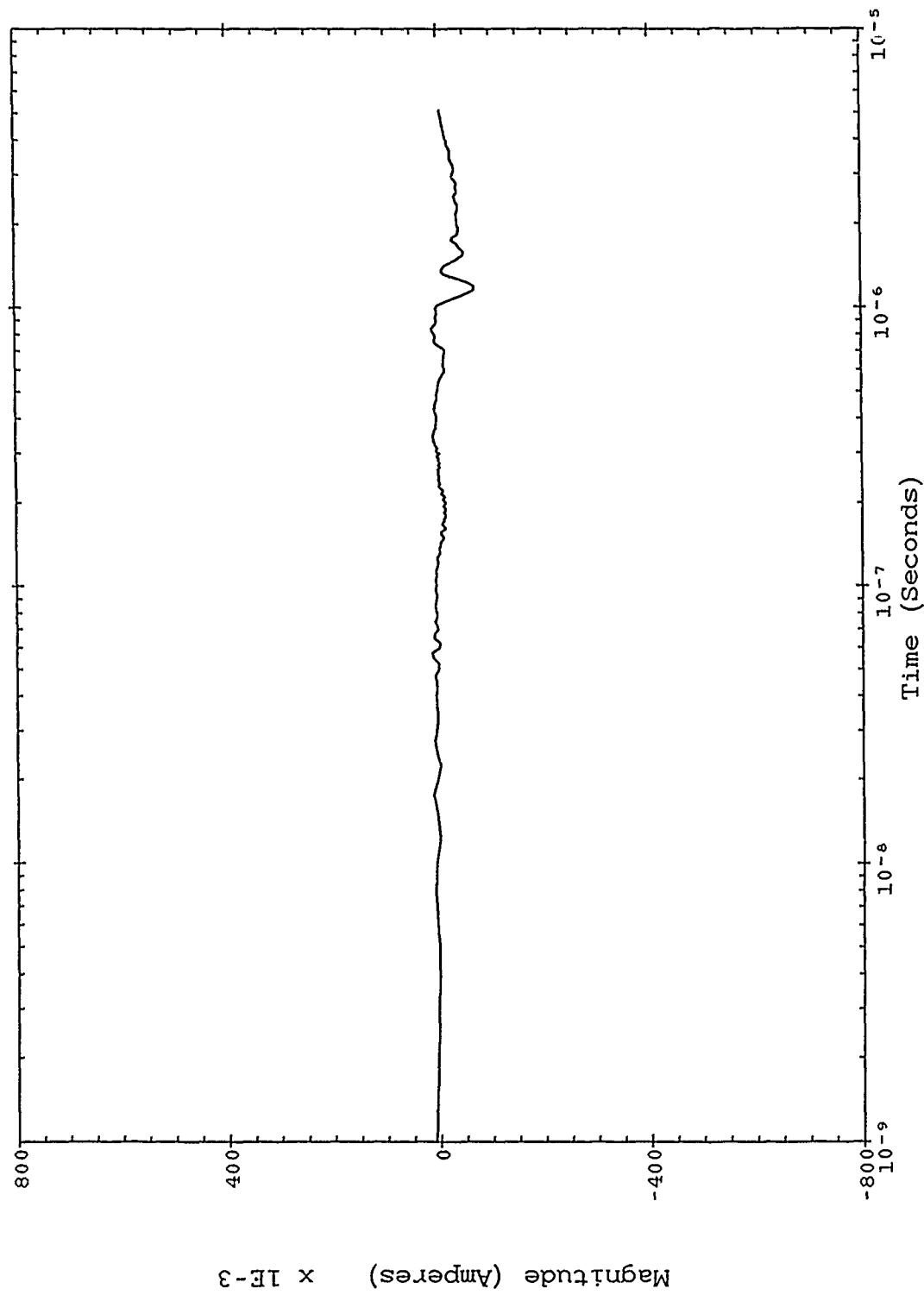


Figure B-94. Severe nearby lightning threat; TP 2238 SN 2154.

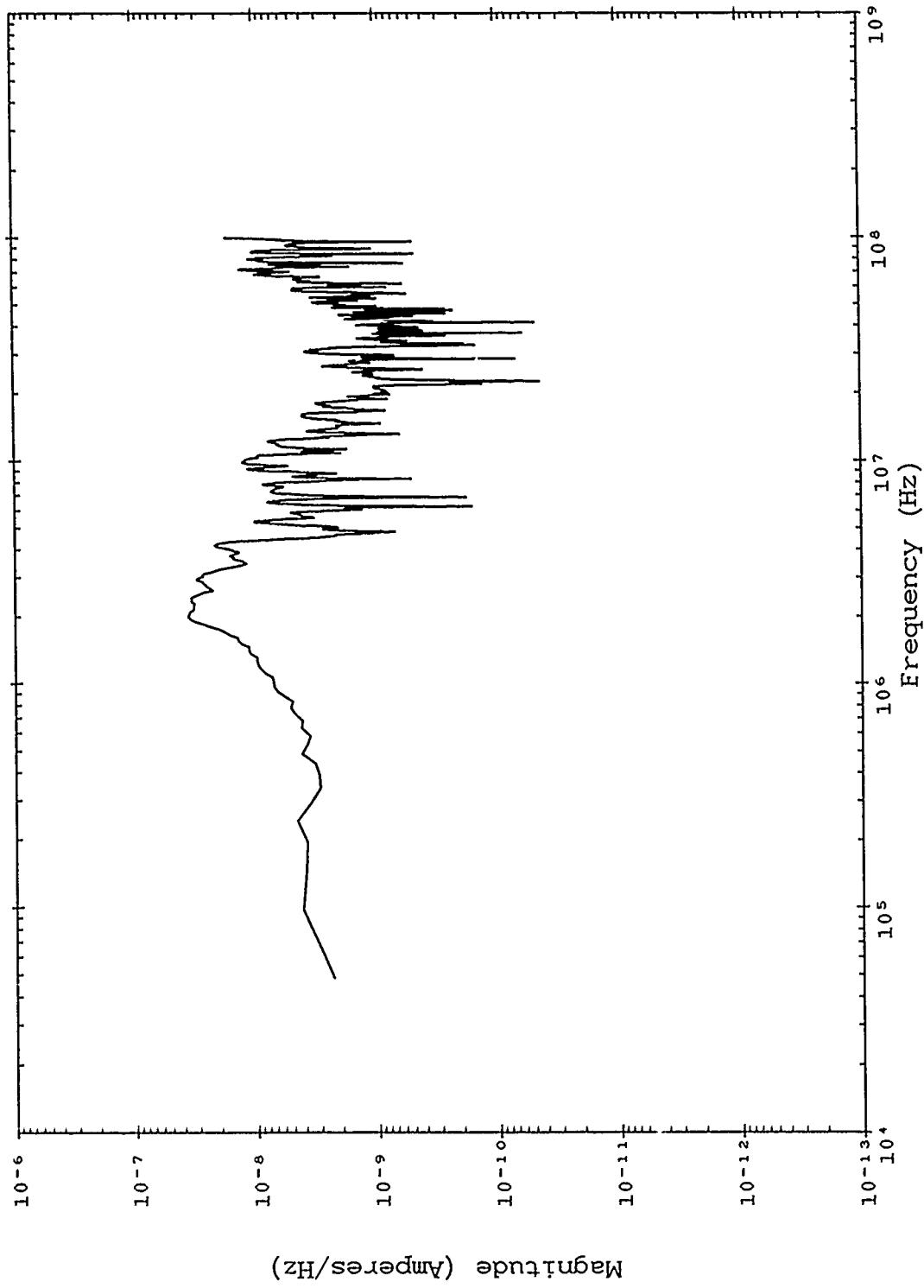


Figure B-95. Double exponential threat; TP 2238 SN 2154.

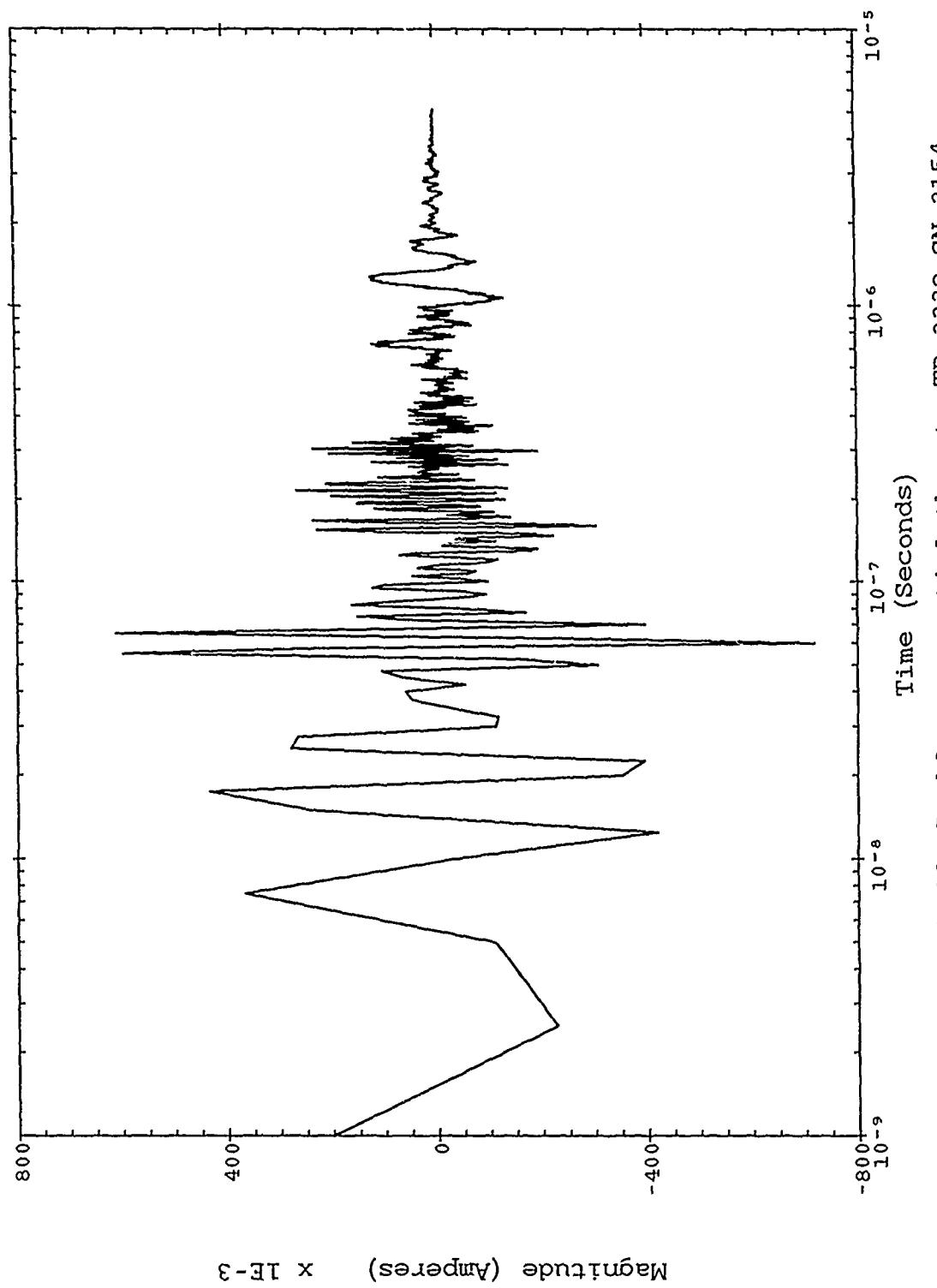


Figure B-96. Double exponential threat; TP 2238 SN 2154.

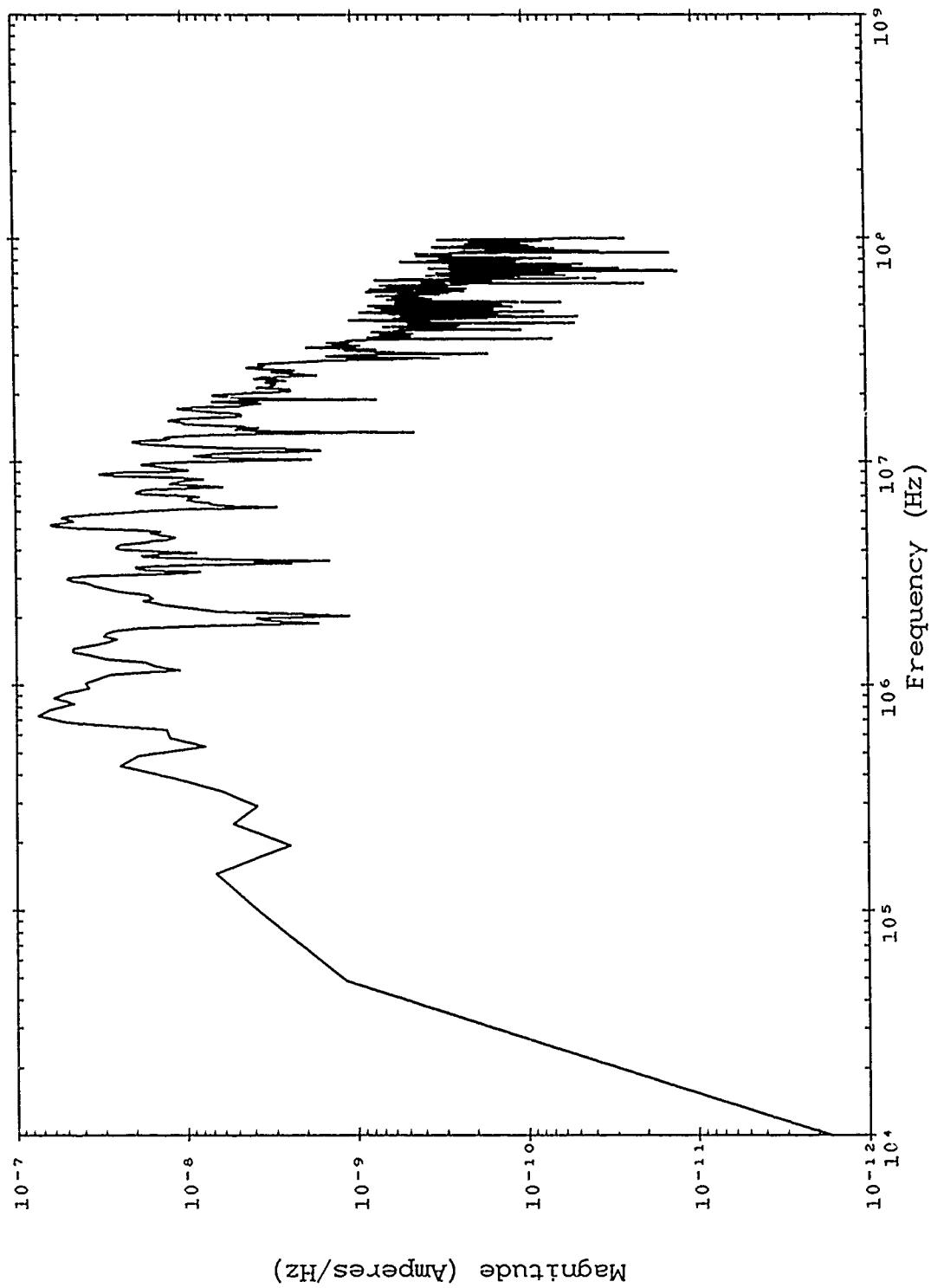


Figure B-97. Corrected TRESTLE data; TP 2391 SN 1734.

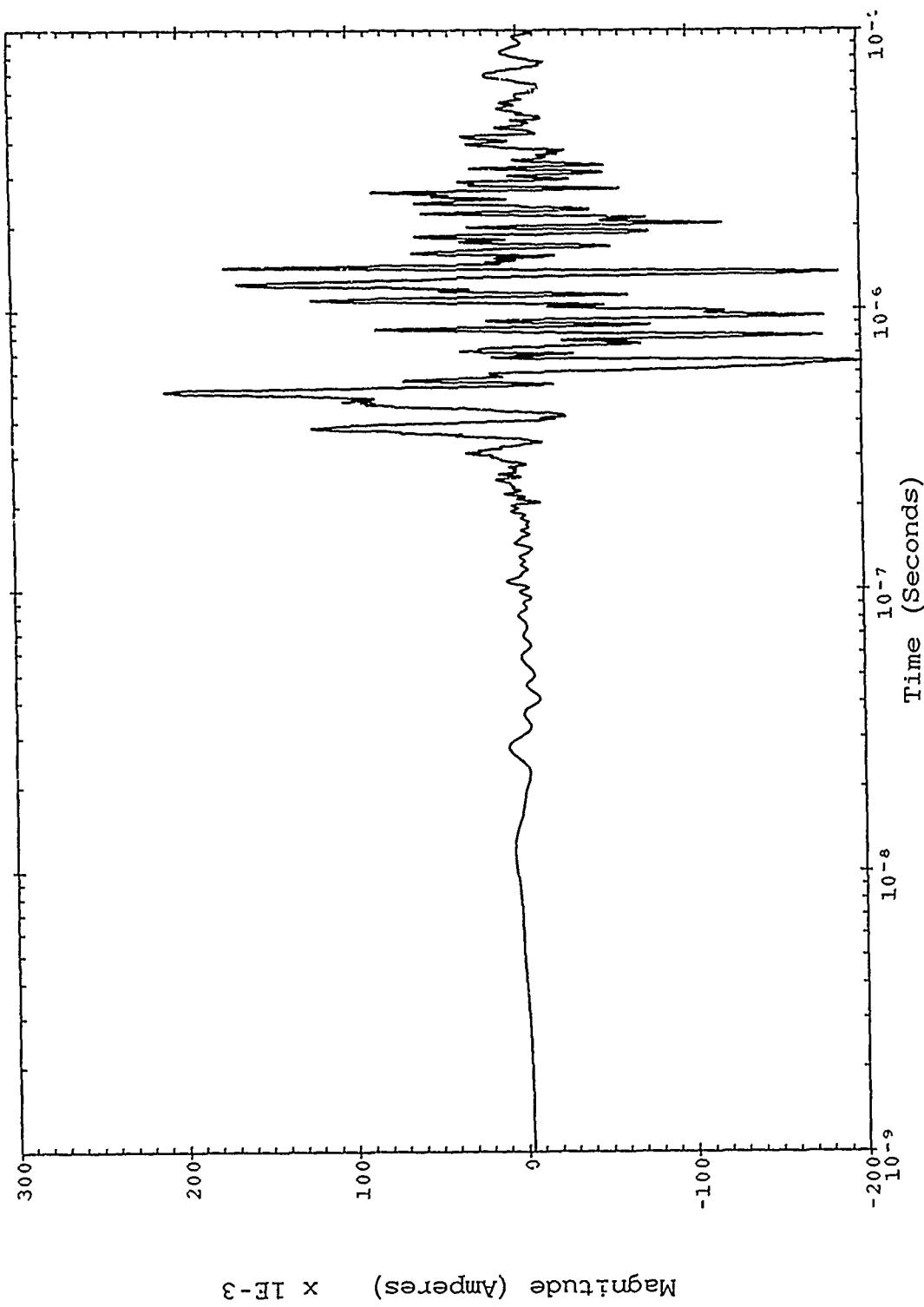


Figure B-98. Corrected TRESTLE data; TP 2391 SN 1734.

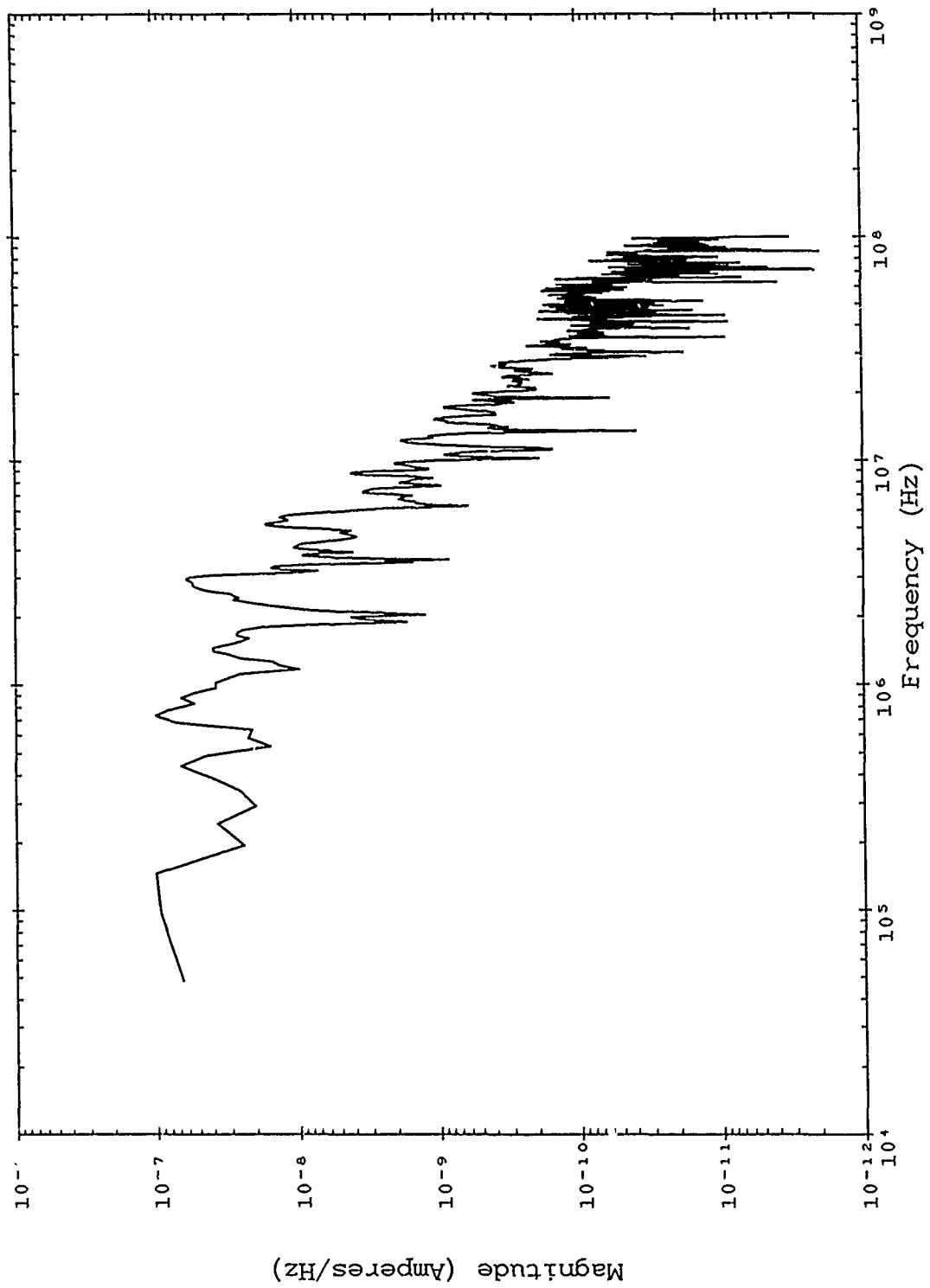


Figure B-99. Severe nearby lightning threat; TP 2391 SN 1734.

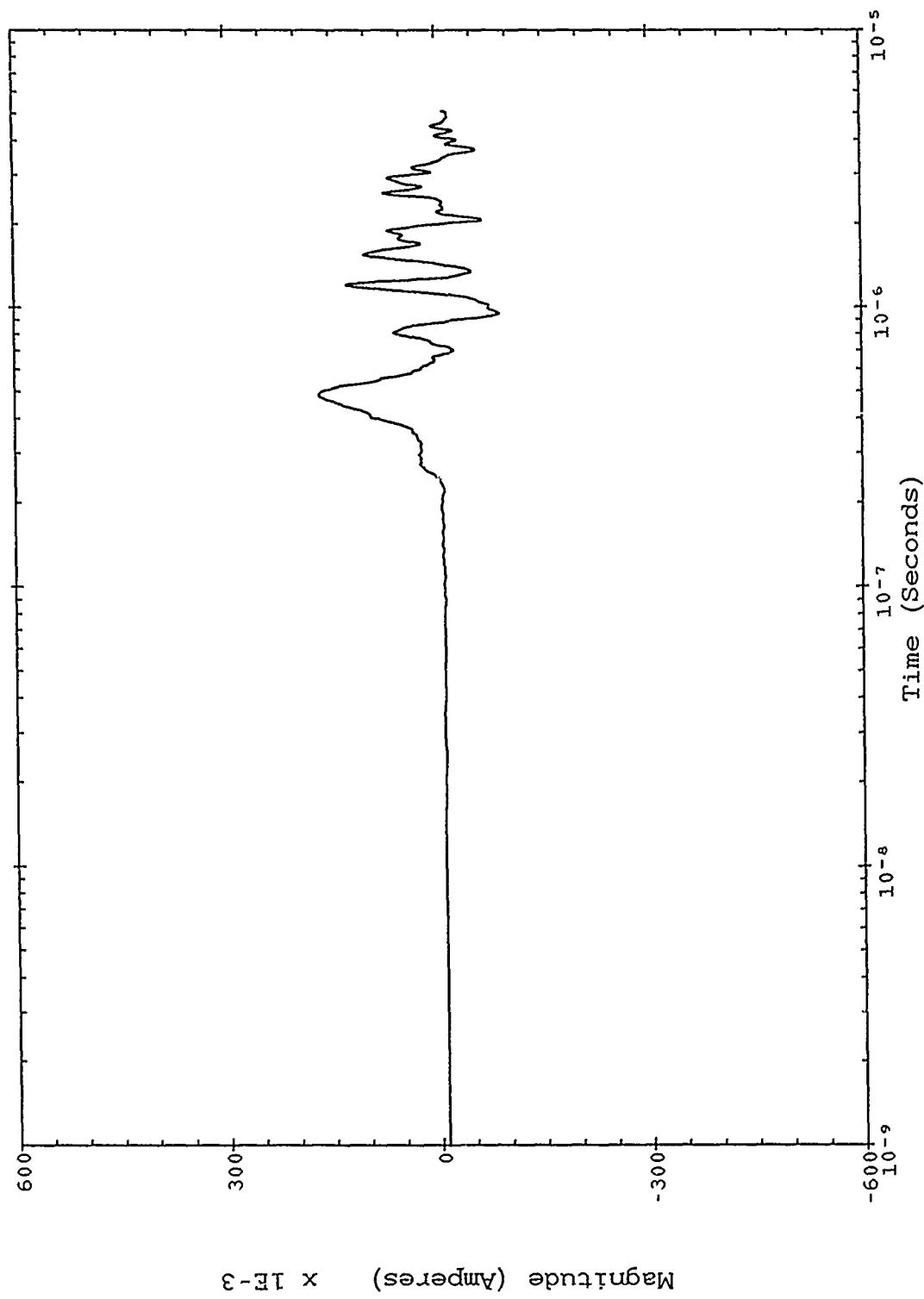


Figure B-100. Severe nearby lightning threat; TP 2391 SN 1734.

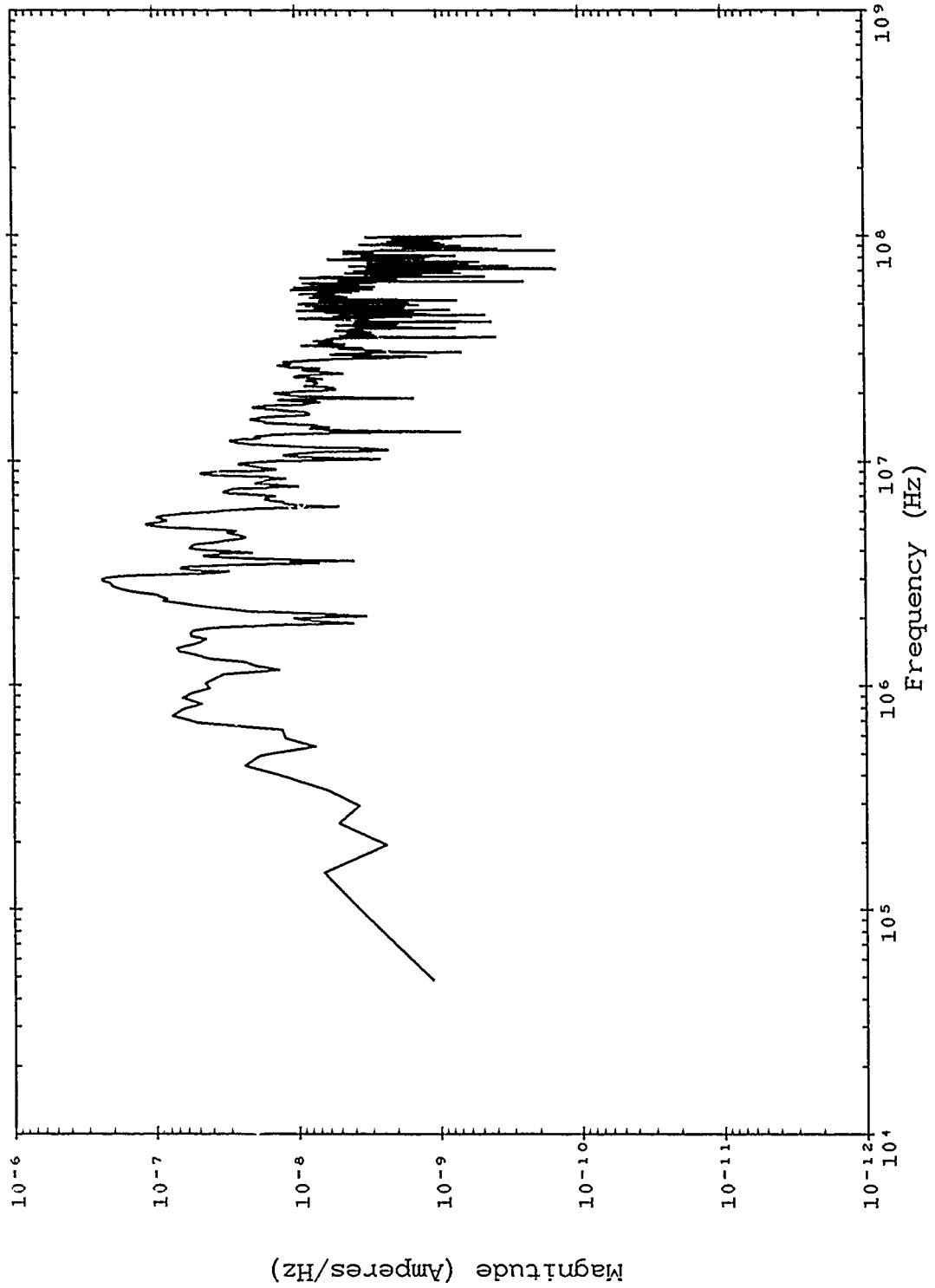


Figure B-101. Double exponential threat; TP 2391 SN 1734.

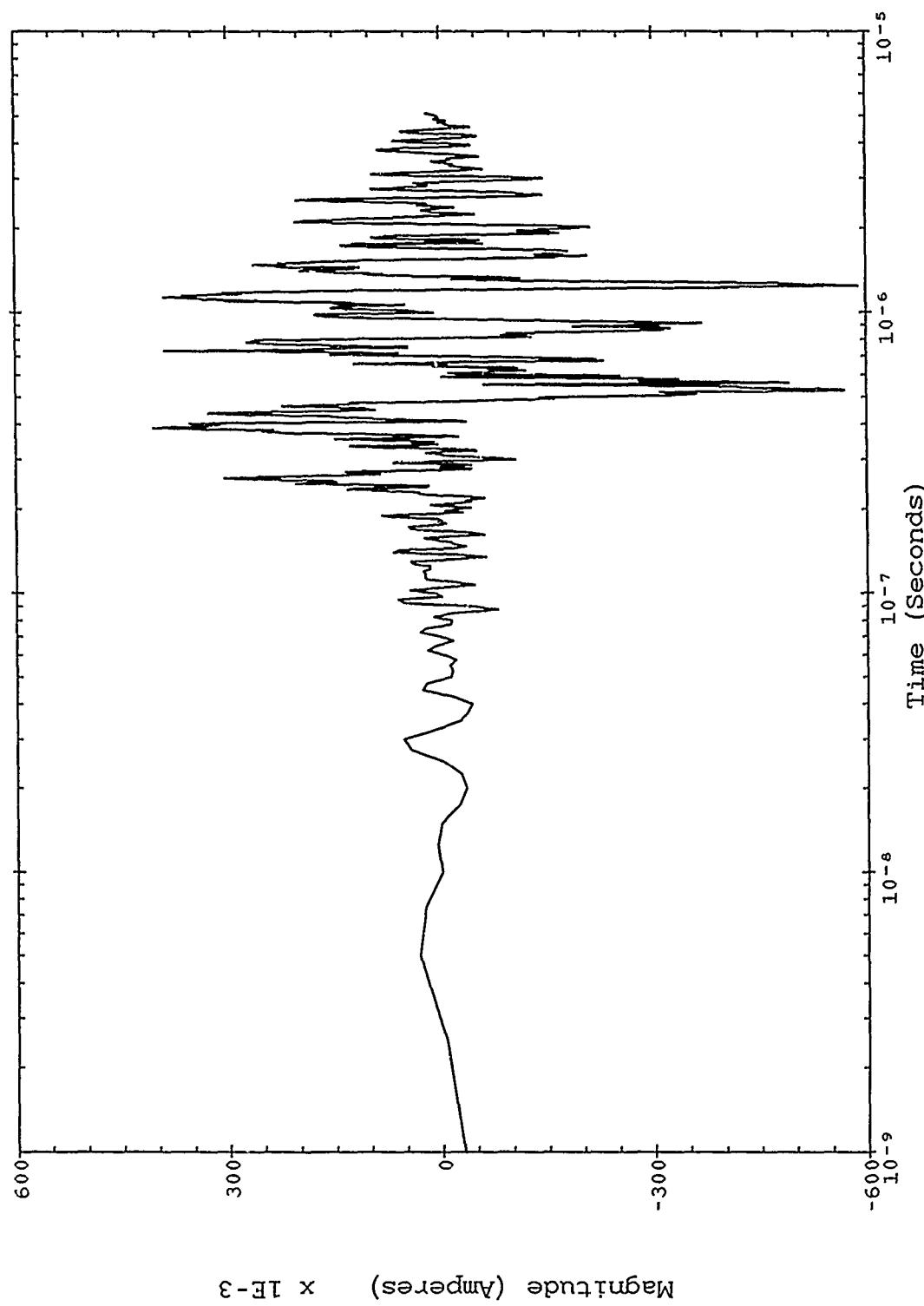


Figure B-102. Double exponential threat; TP 2391 SN 1734.

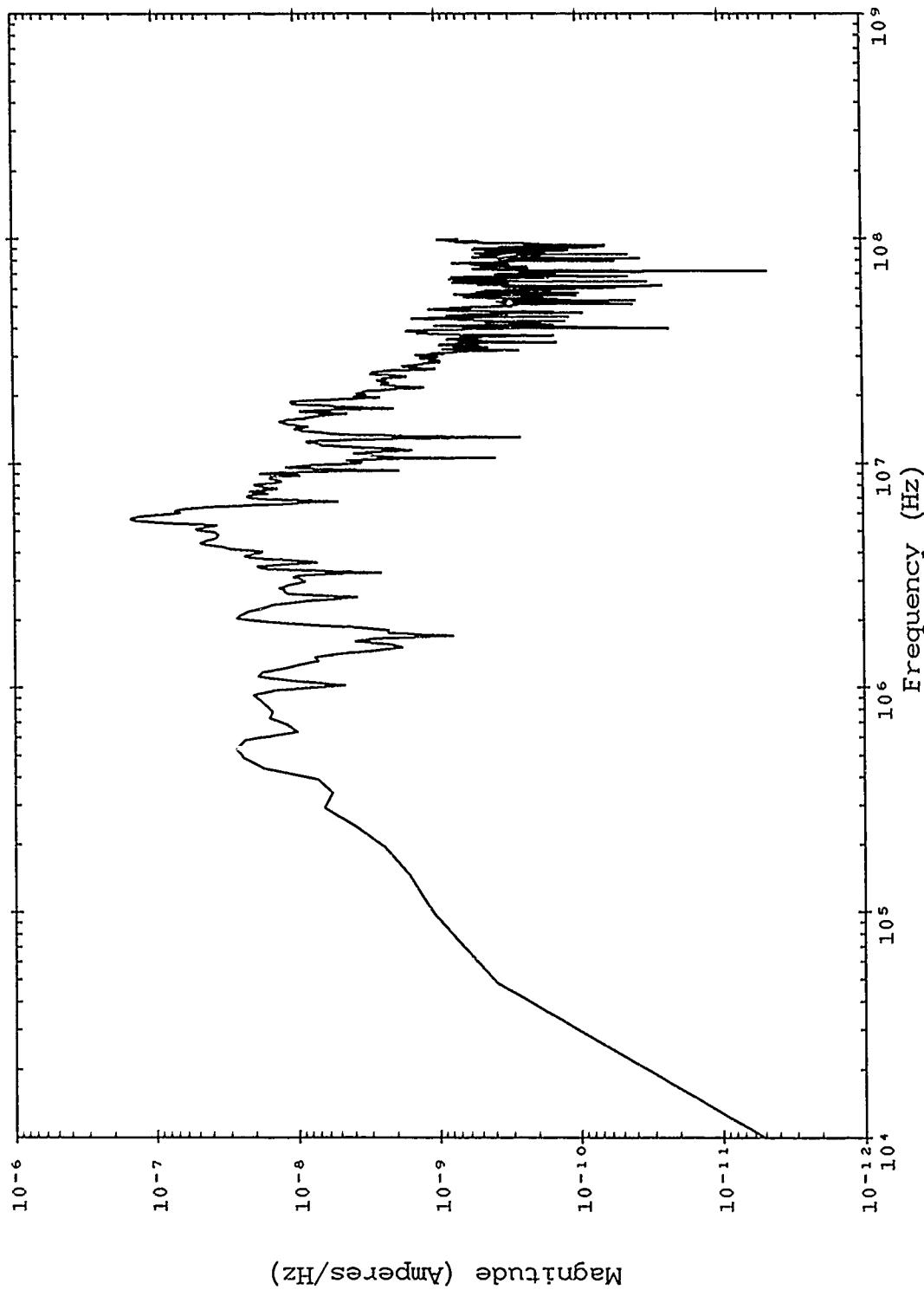


Figure B-103. Corrected TRESTLE data; TP 2426 SN 1306.

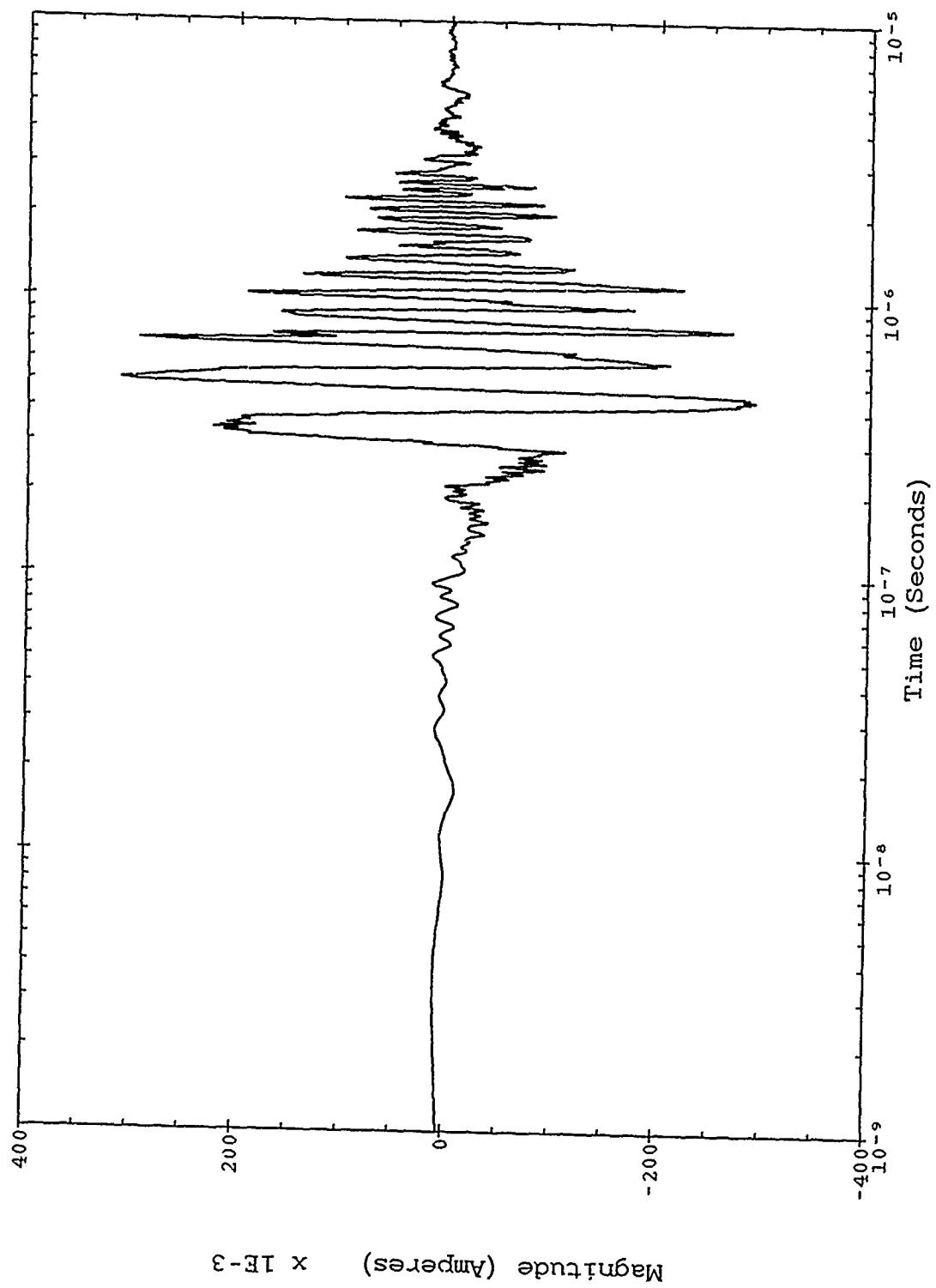


Figure B-104. Corrected TRESTLE data; TP 2426 SN 1306.

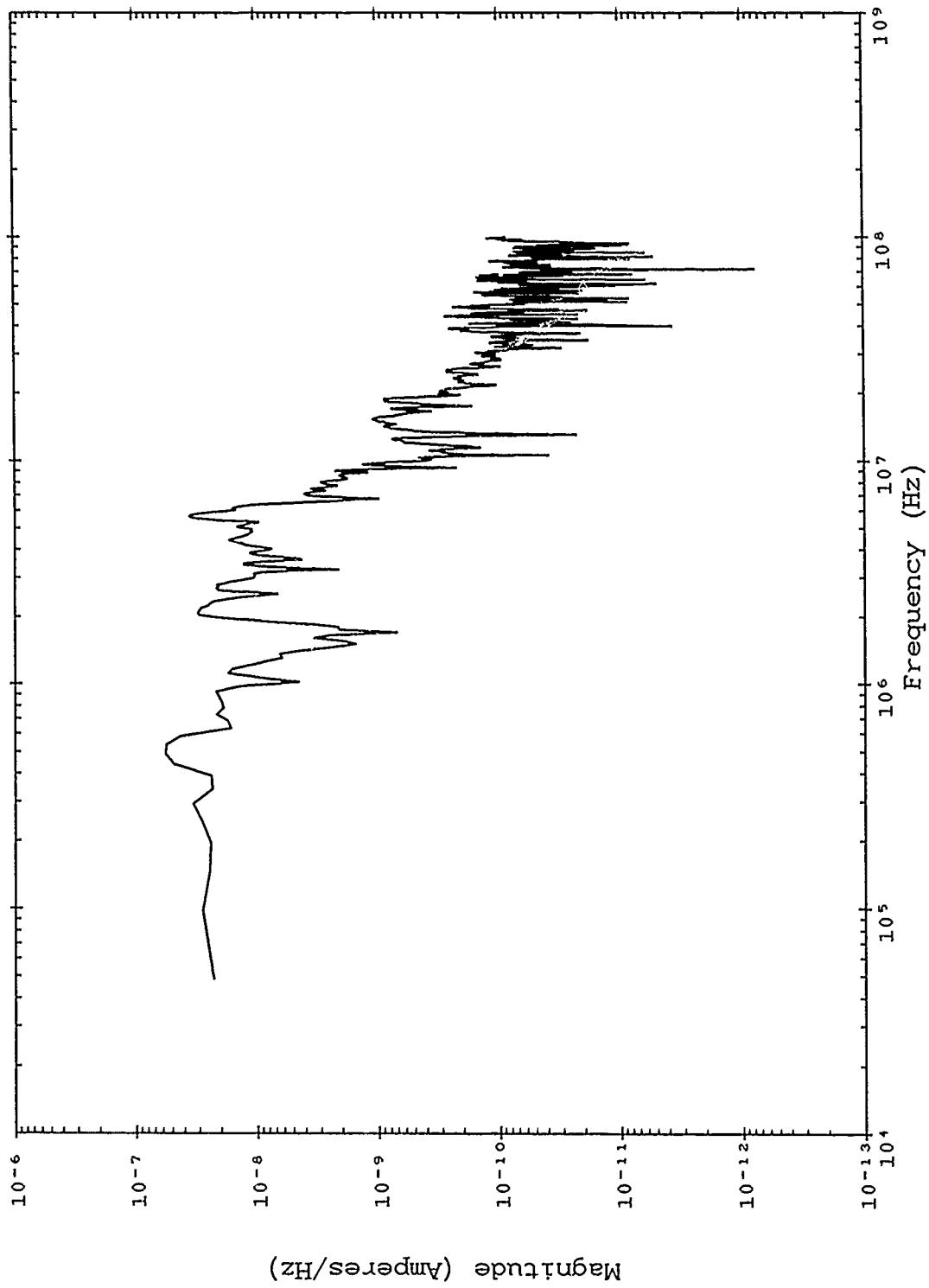


Figure B-105. Severe nearby lightning threat; TP 2426 SN 1306.

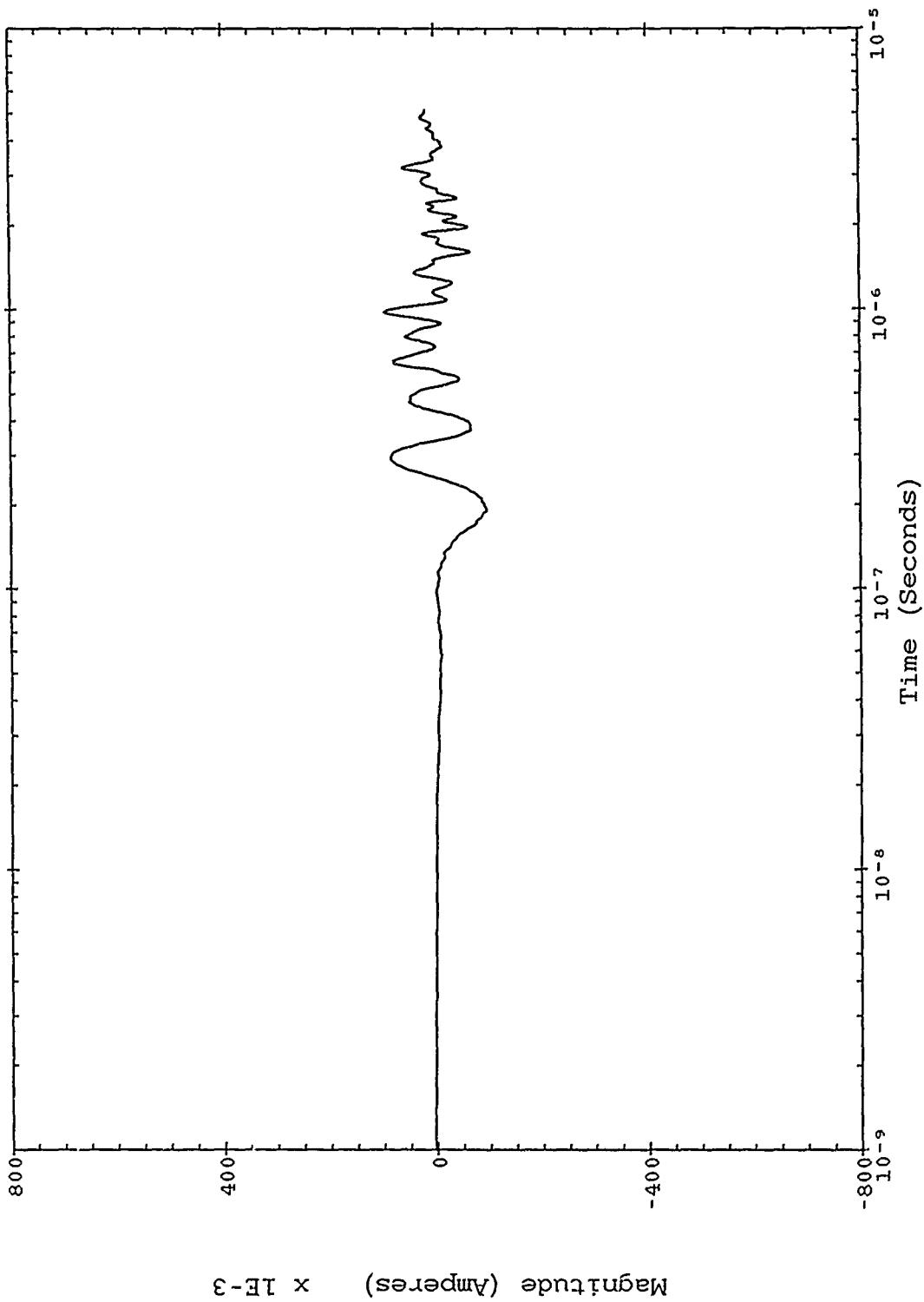


Figure B-106. Severe nearby lightning threat; TP 2426 SN 1306.

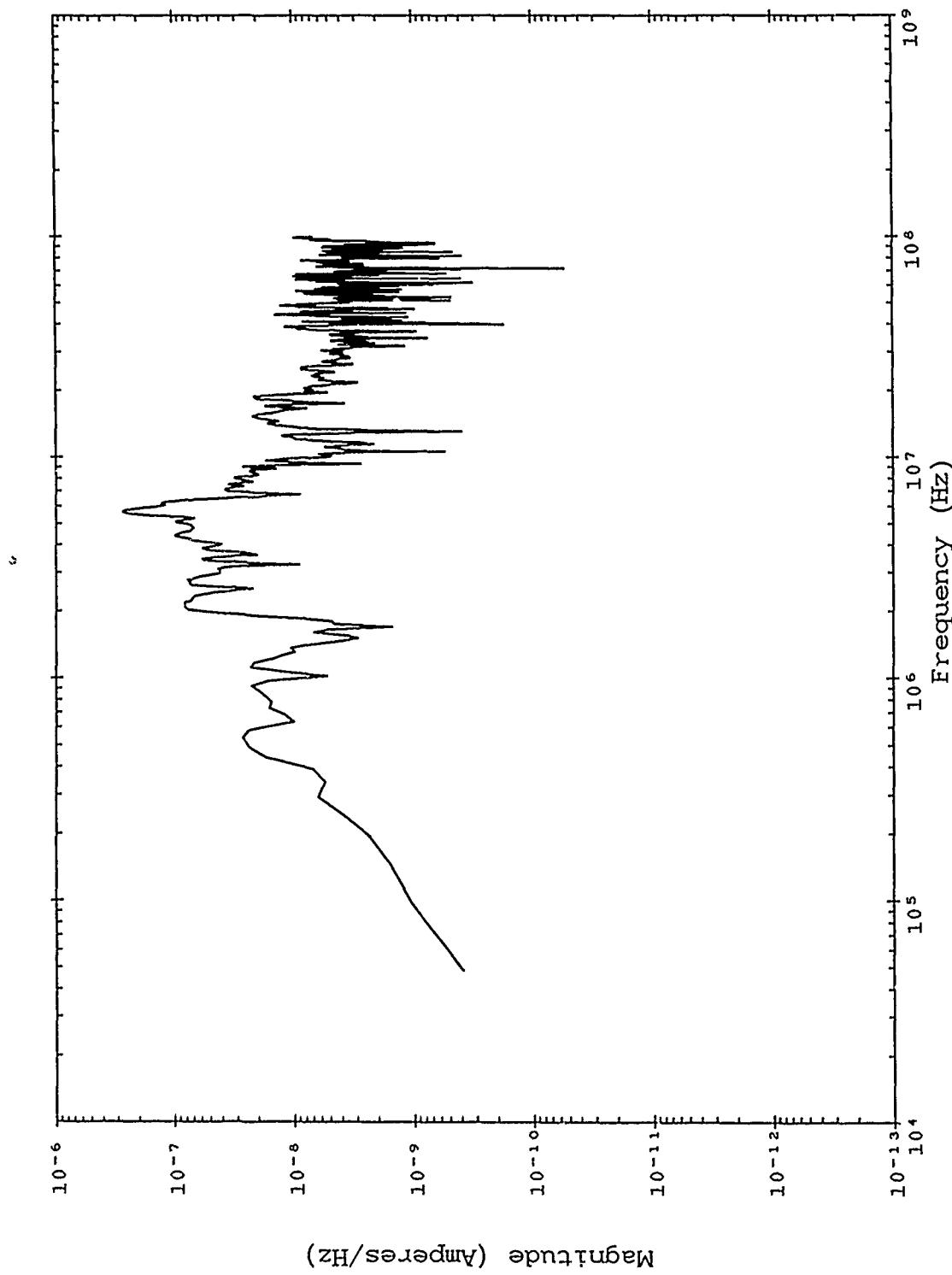


Figure B-107. Double exponential threat; TP 2426 SN 1306.

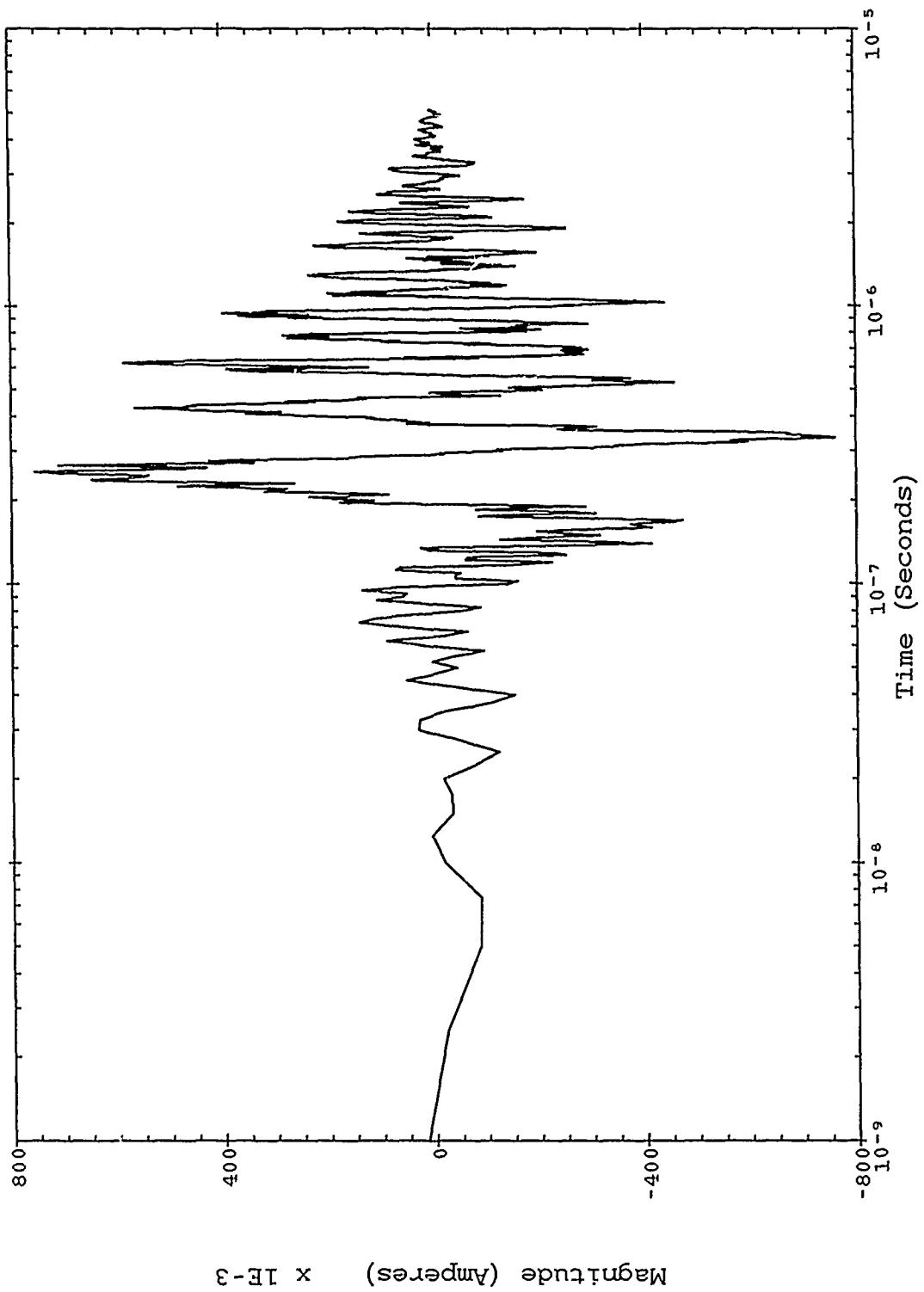


Figure B-108. Double exponential threat; TP 2426 SN 1306.

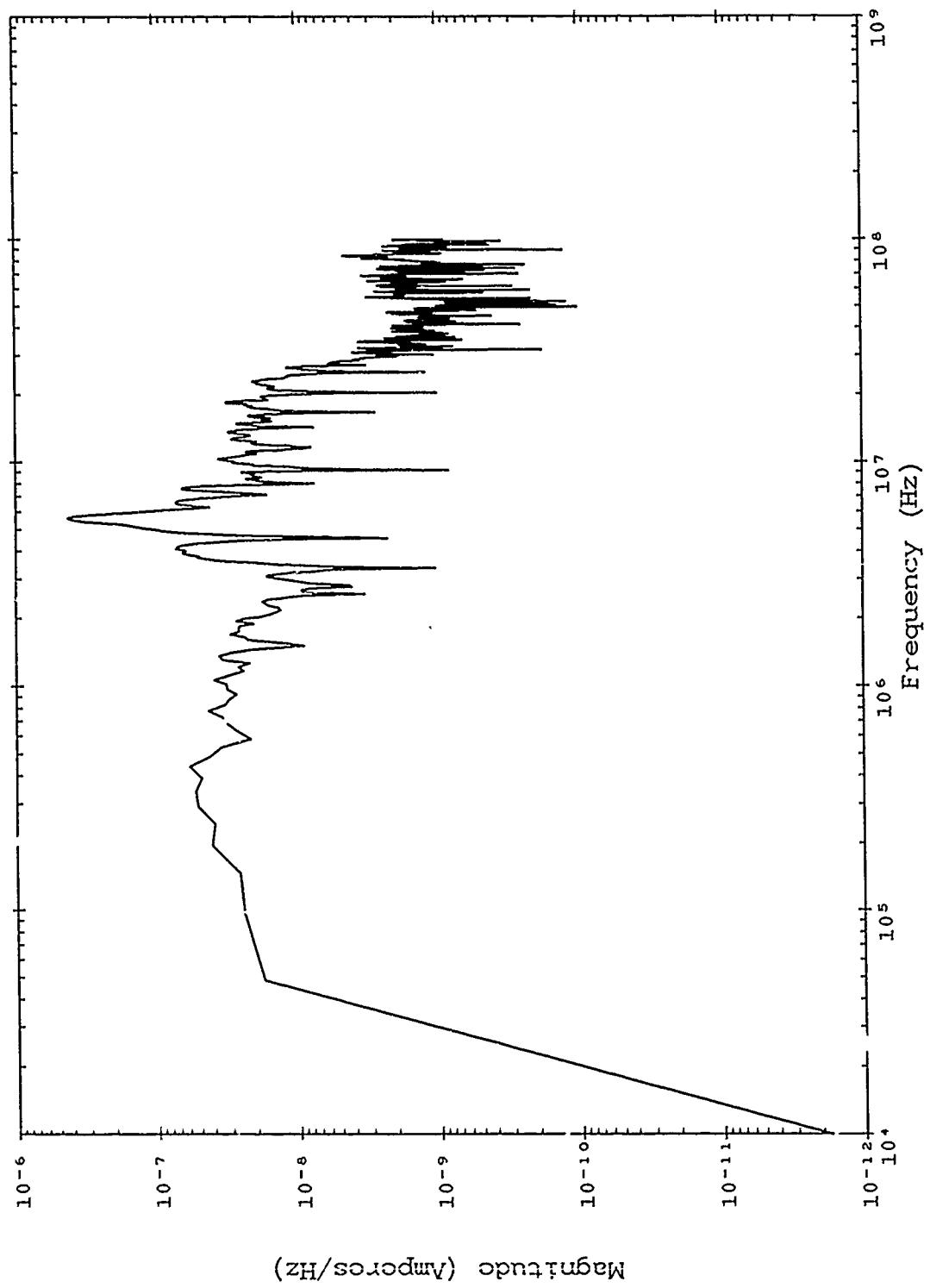


Figure B-109. Corrected TRESTLE data; TP 2717 SN 2560.

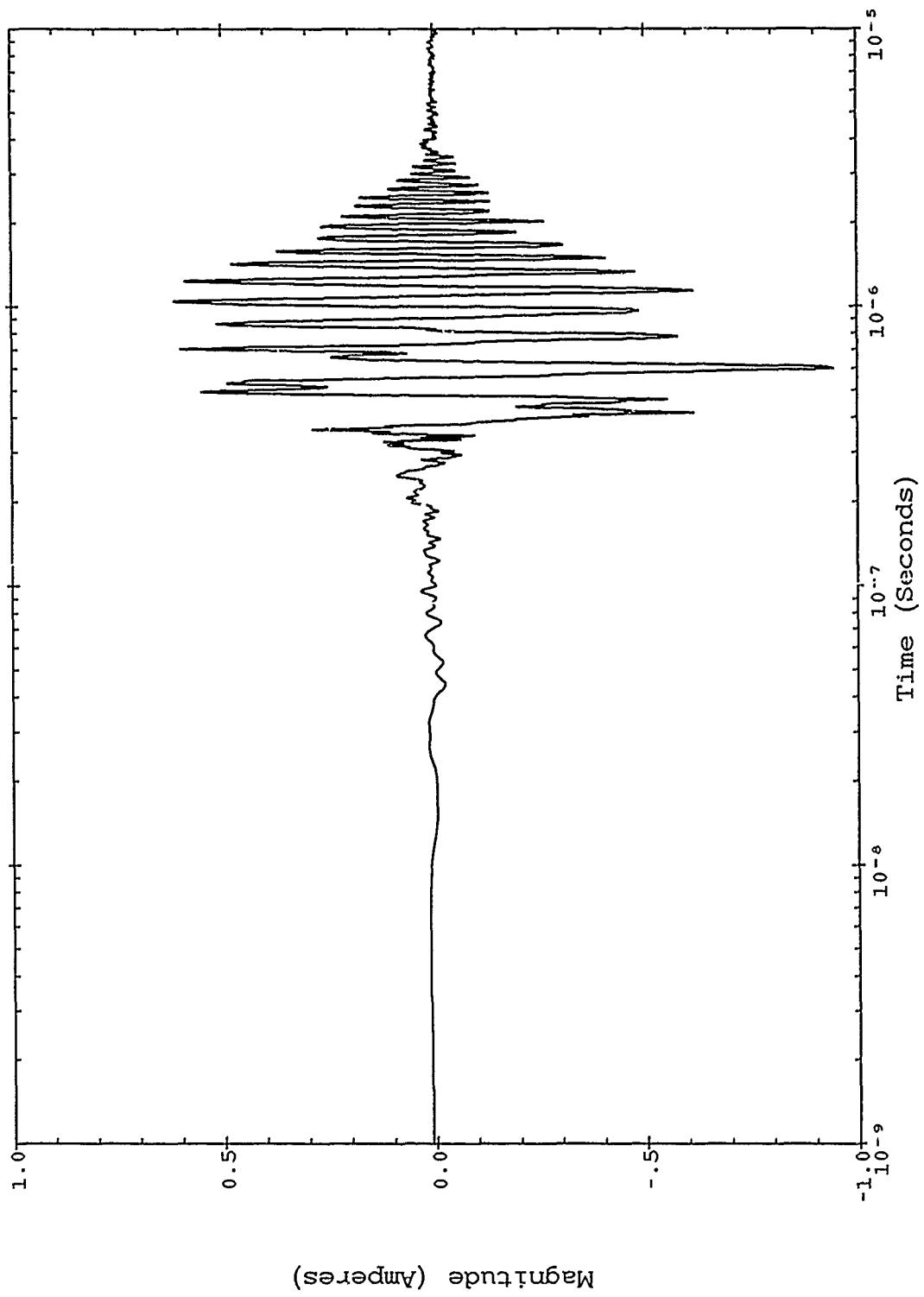


Figure B-110. Corrected TRESTLE data; TP 2717 SN 2560.

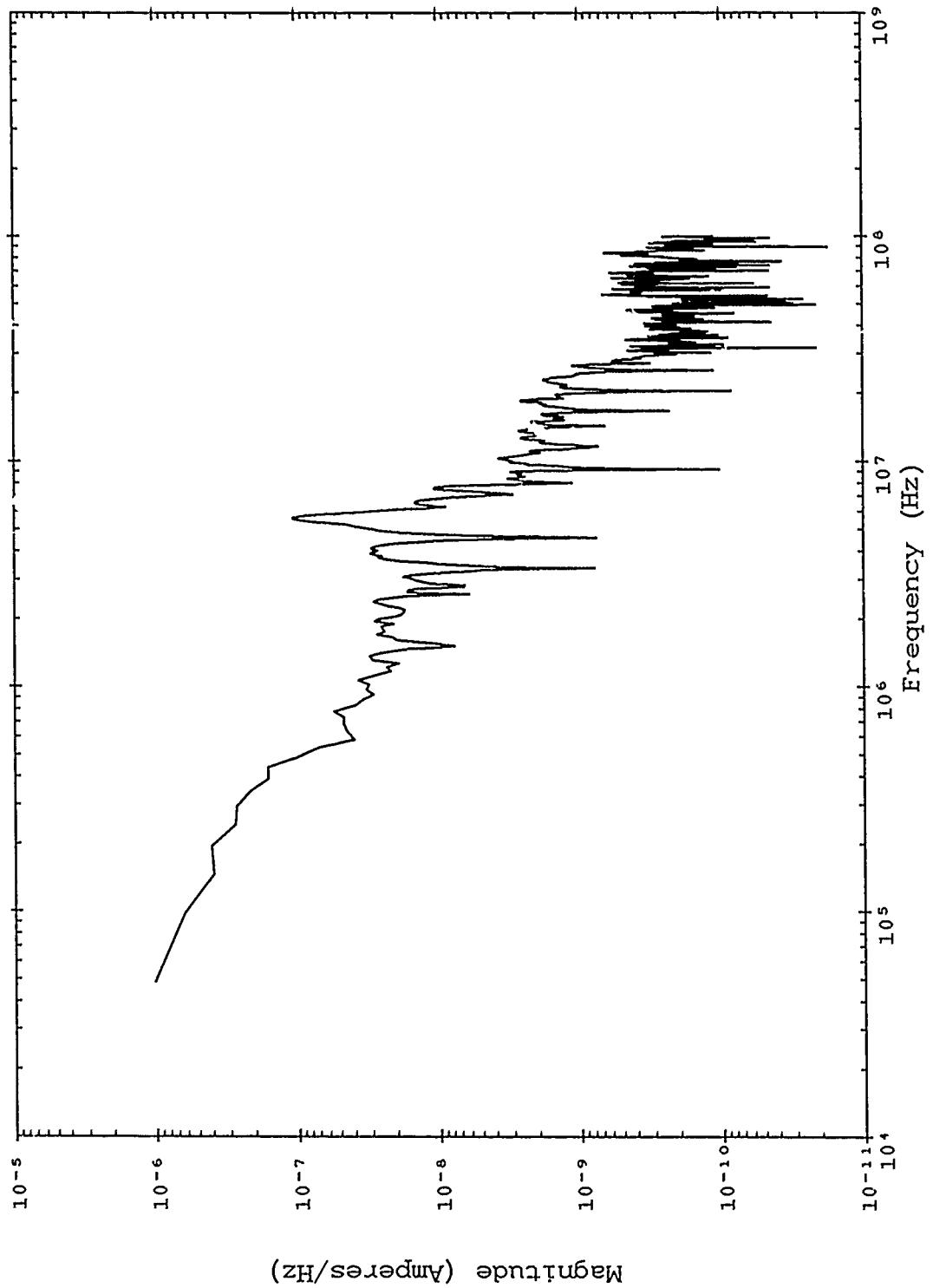


Figure B-111. Severe nearby lightning threat; TP 2717 SN 2560.

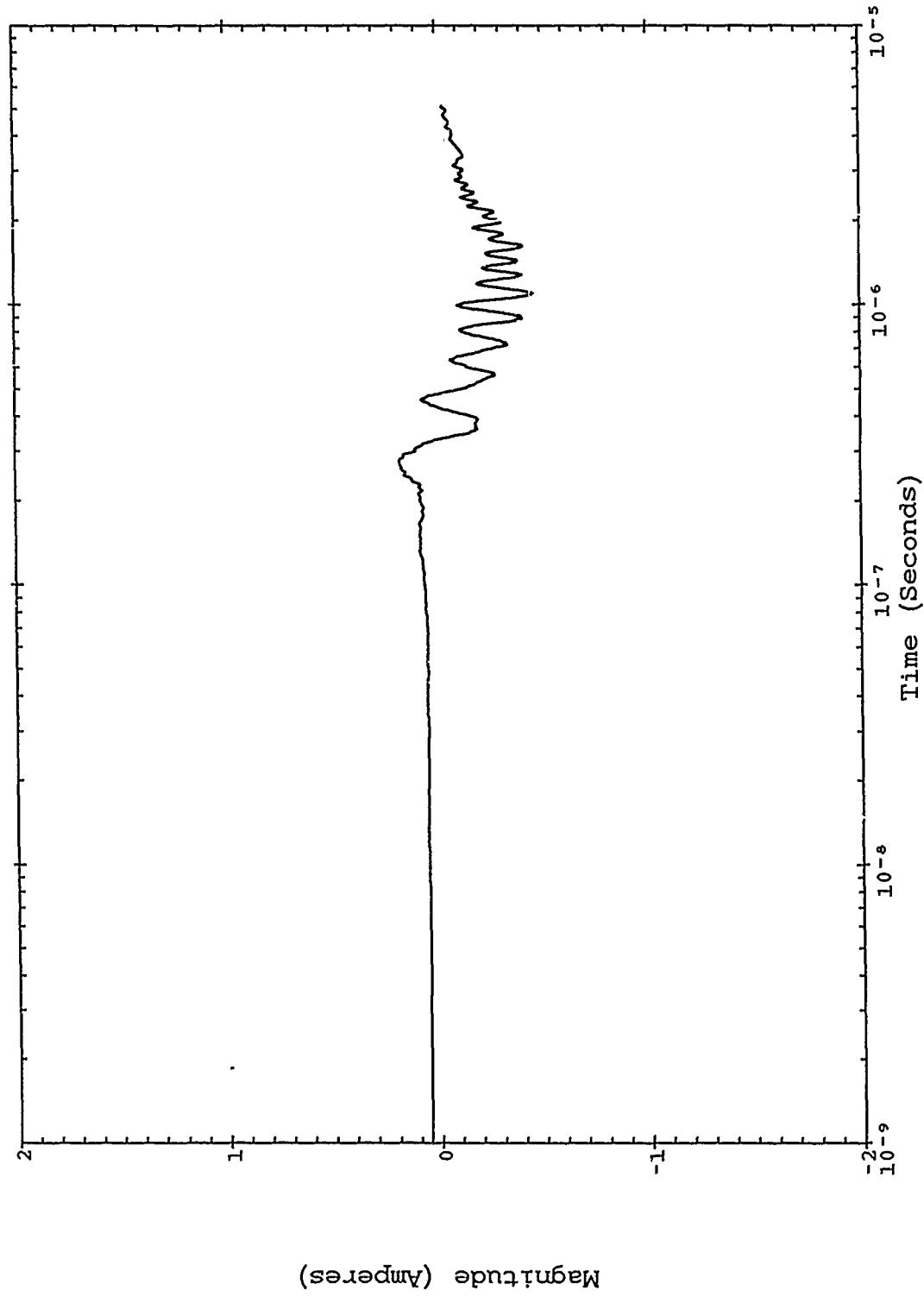


Figure B-112. Severe nearby lightning threat; TP 2717 SN 2560.

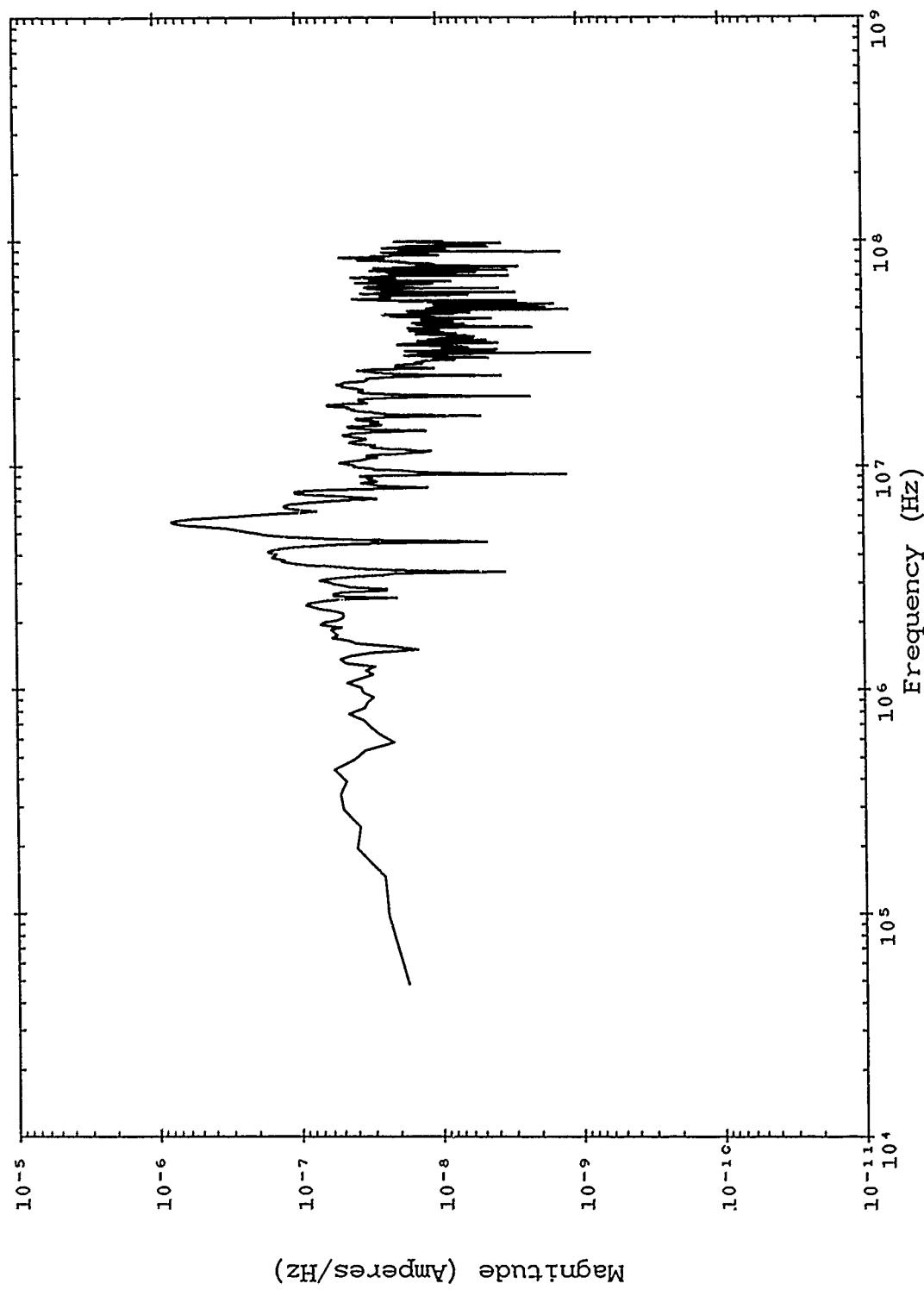


Figure B-113. Double exponential threat; TP 2717 SN 2560.

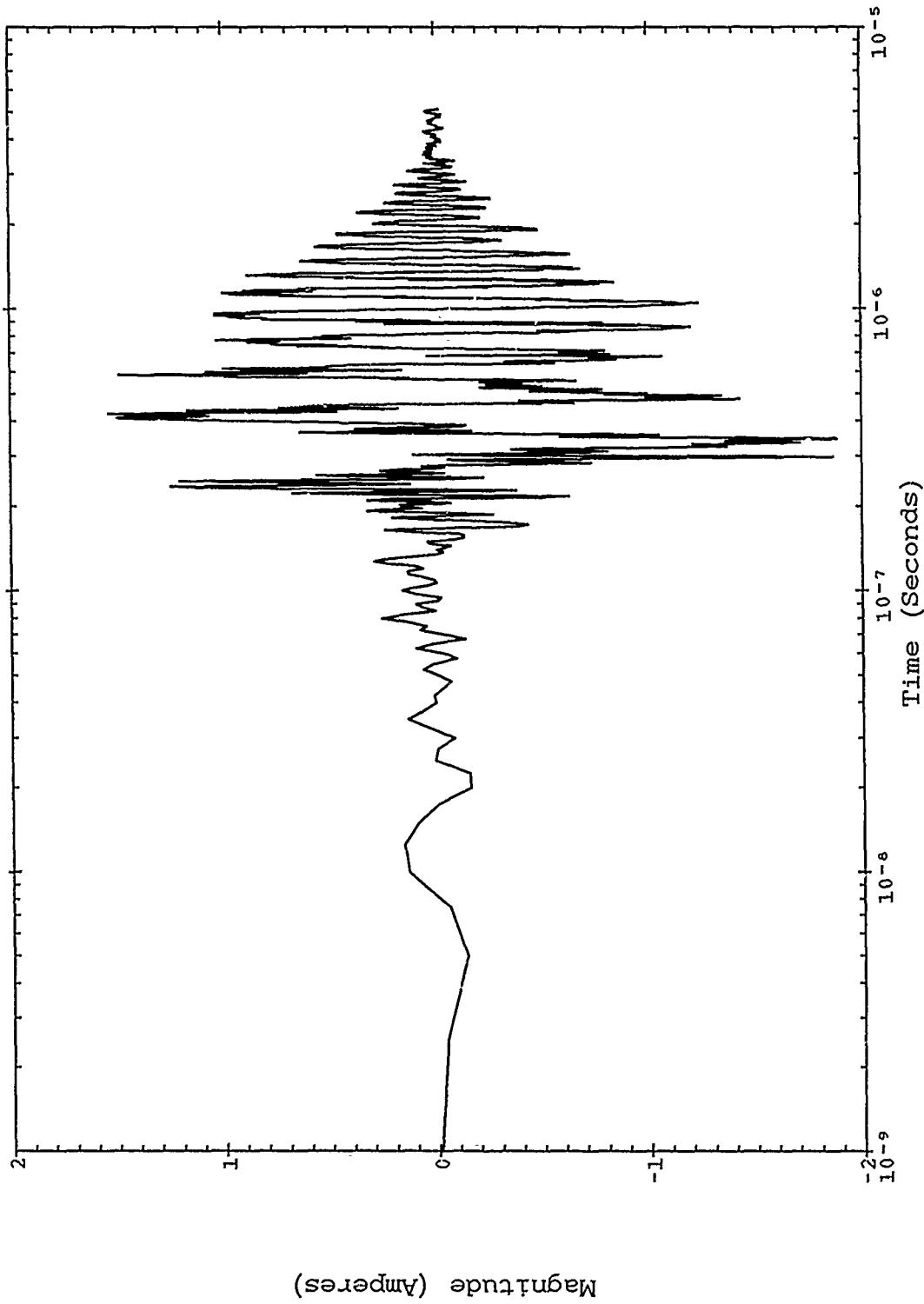


Figure B-114. Double exponential threat; TP 2717 SN 2560.

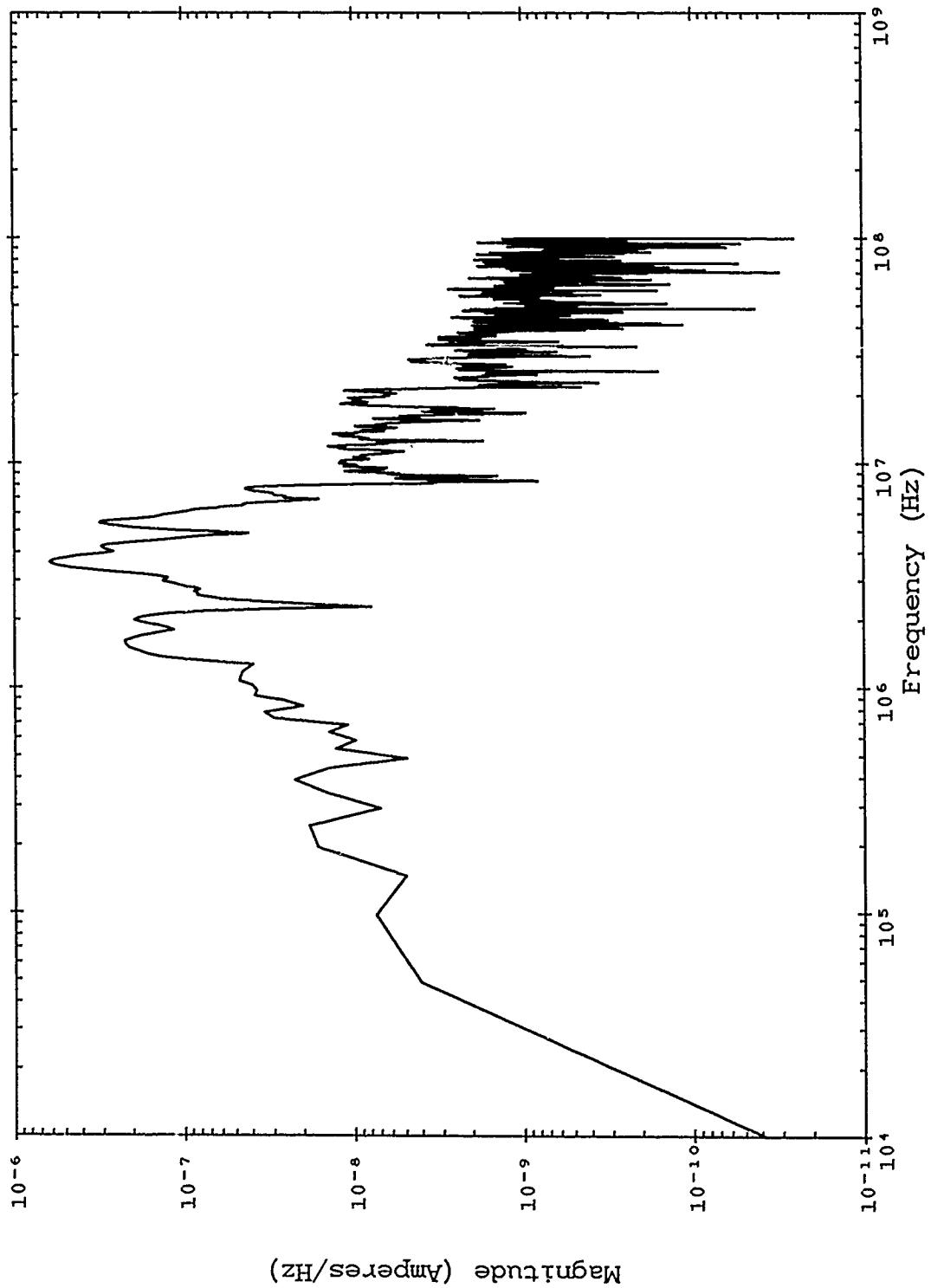


Figure B-115. Corrected TRESTLE data; TP 2866 SN 2274.

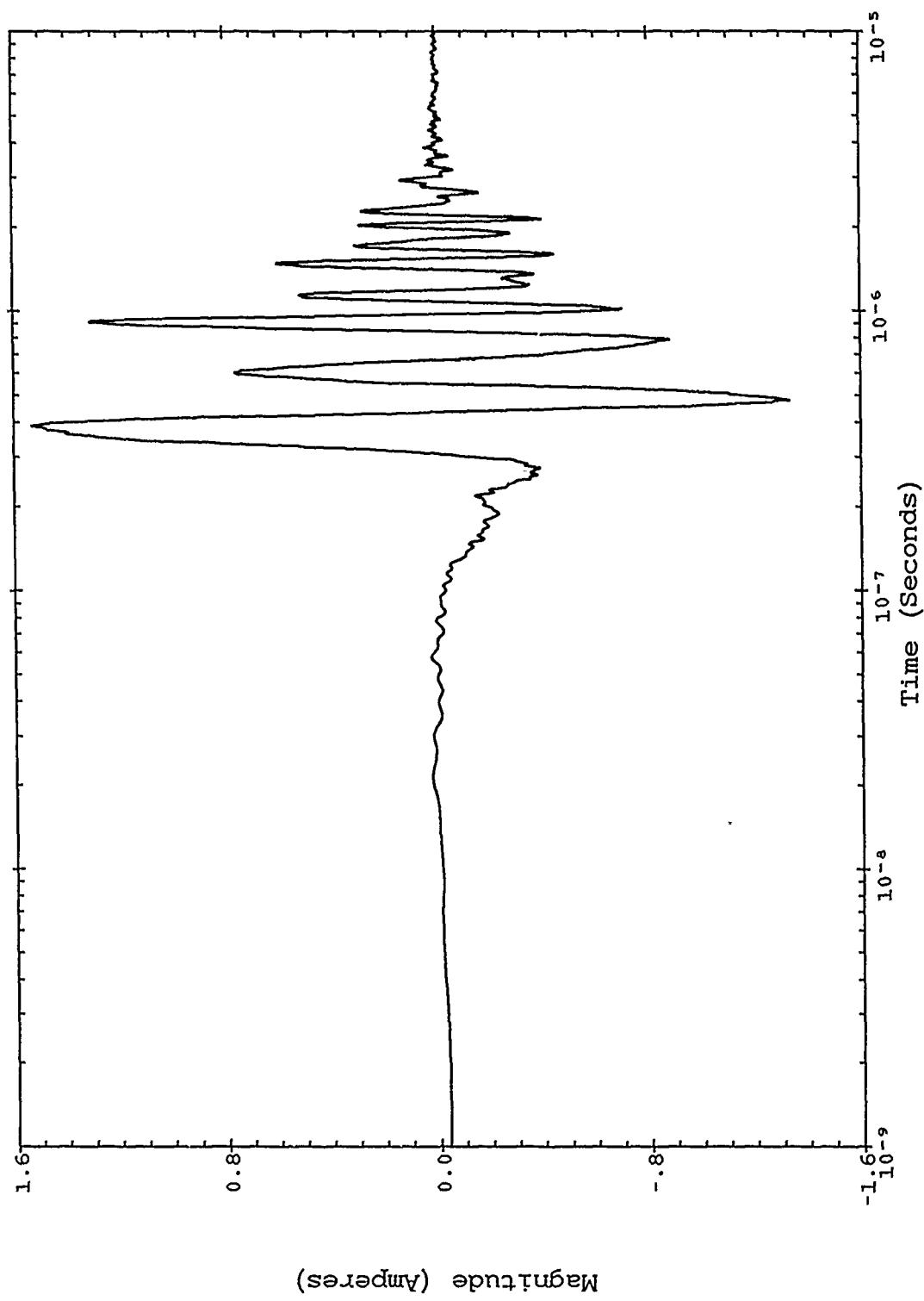


Figure B-116. Corrected TRESTLE data; TP 2866 SN 2274.

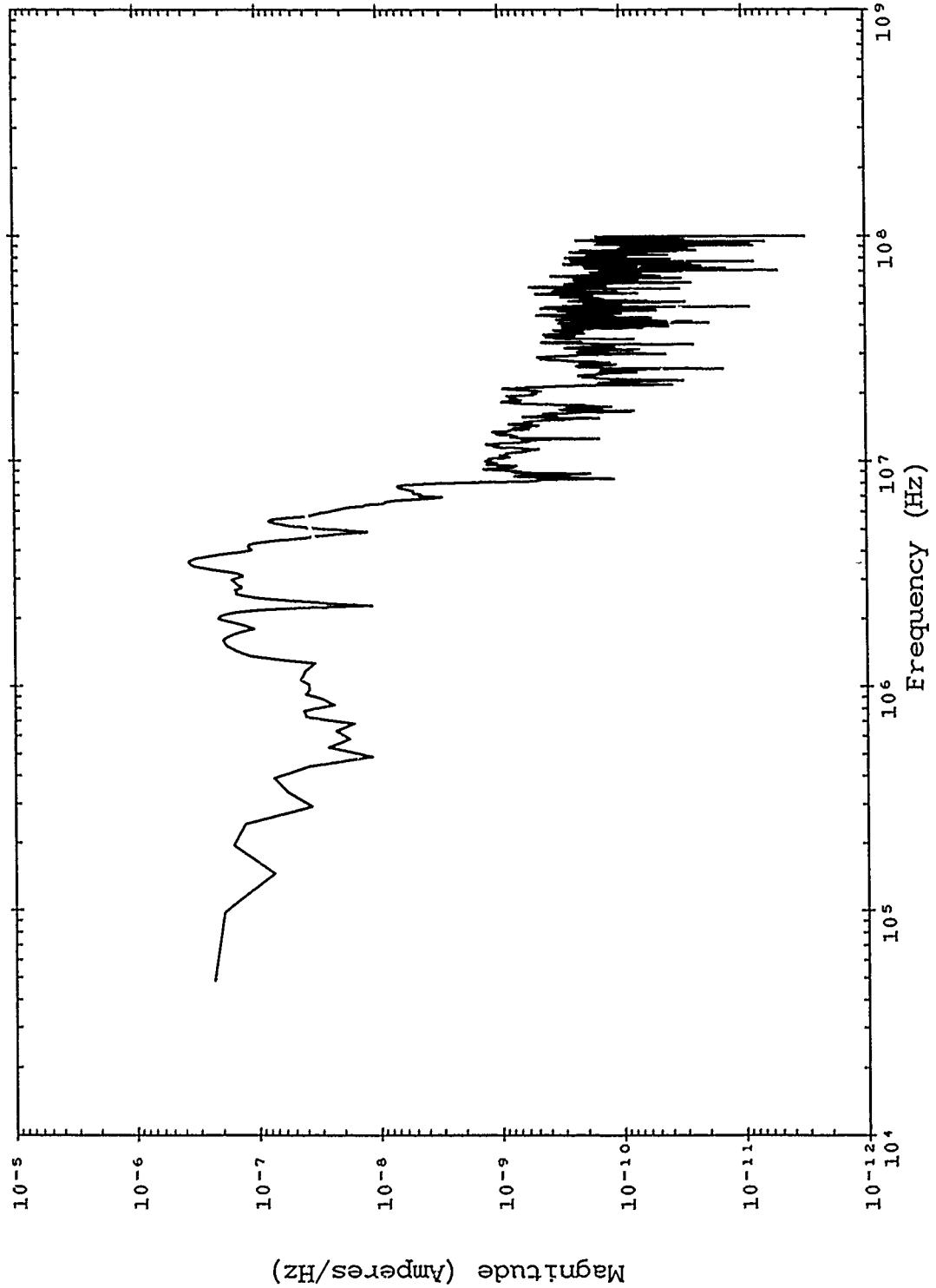


Figure B-117. Severe nearby lightning threat; TP 2866 SN 2274.

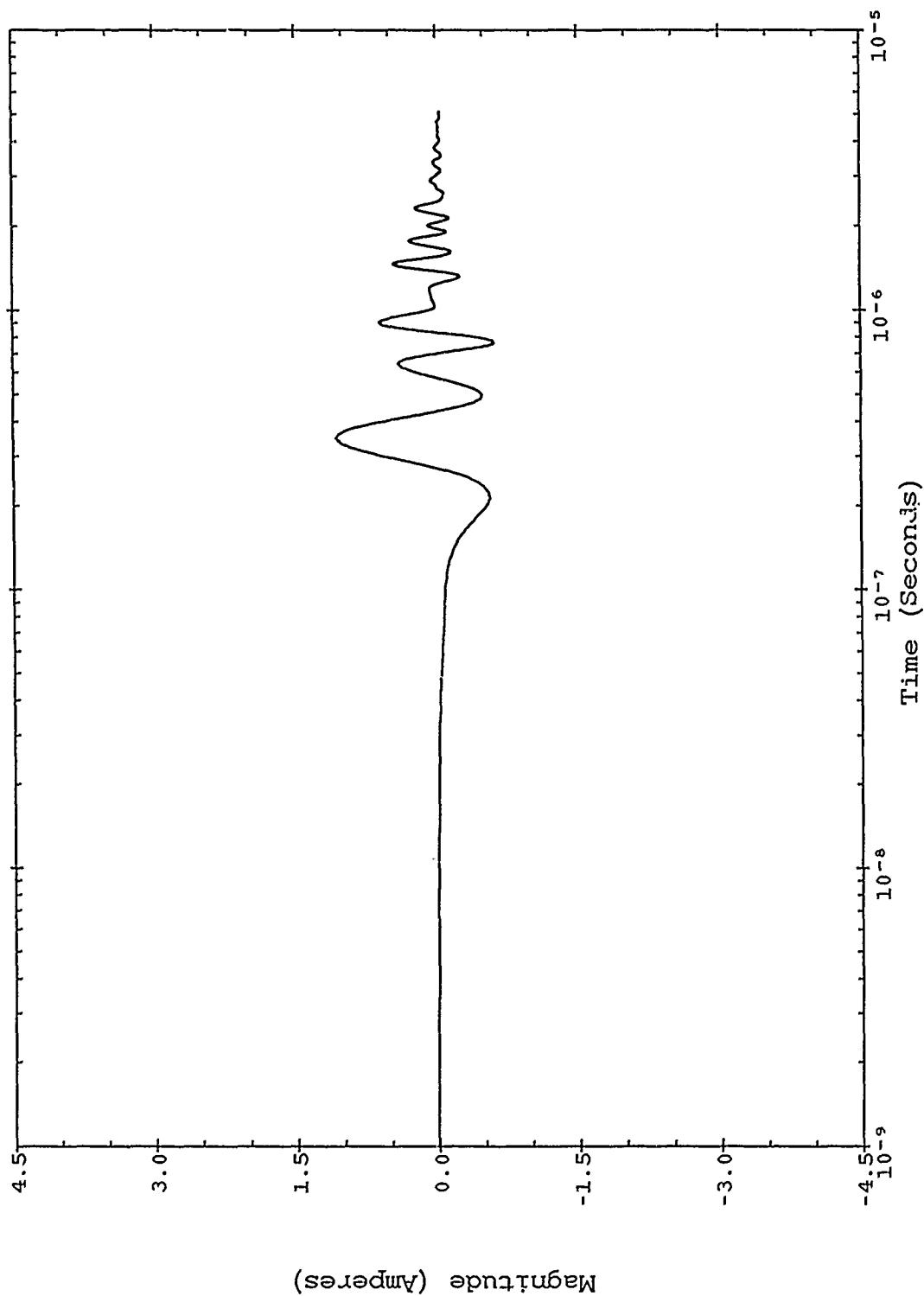


Figure B-118. Severe nearby lightning threat; TP 2866 SN 2274.

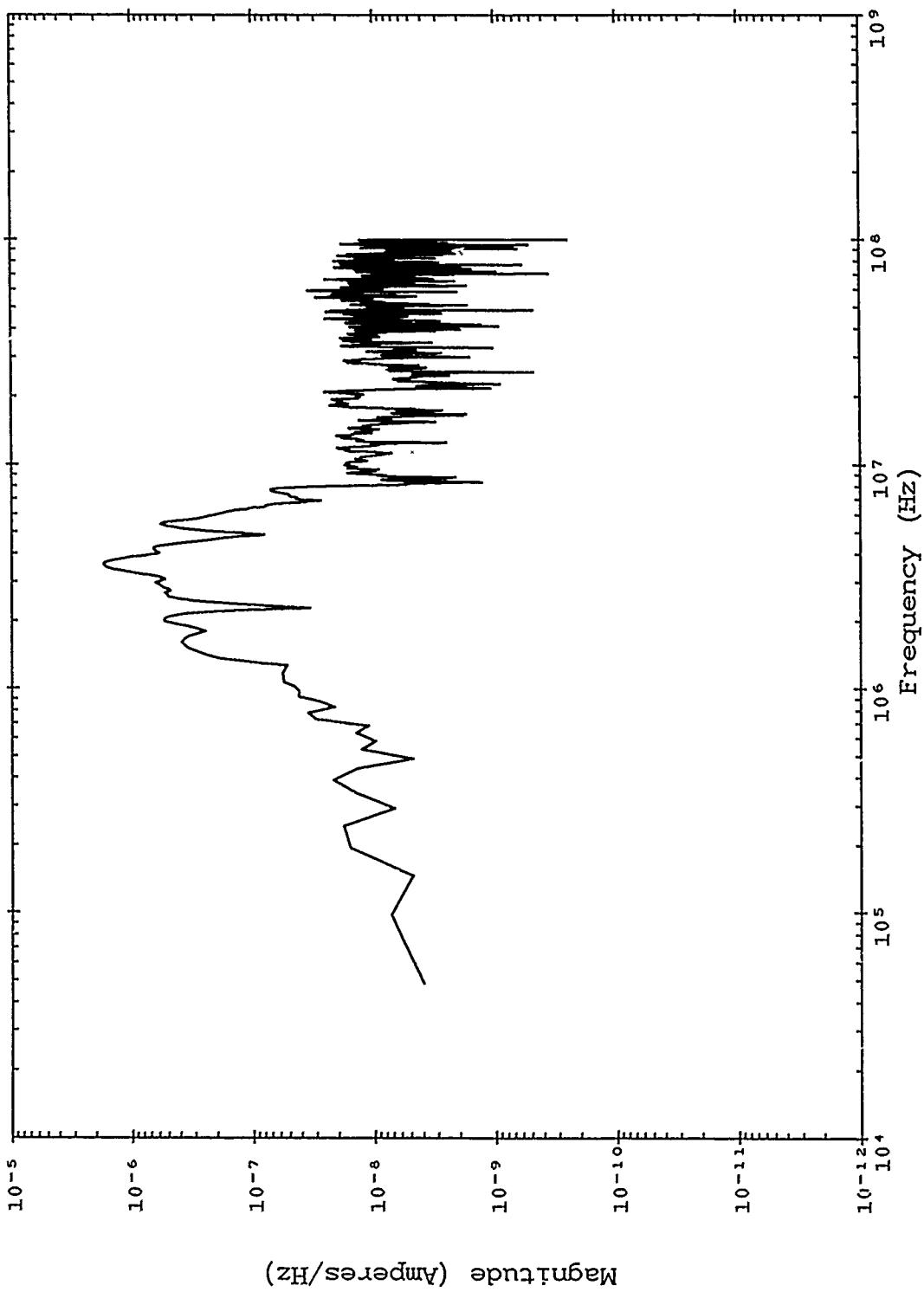


Figure B-119. Double exponential threat; TP 2866 SN 2274.

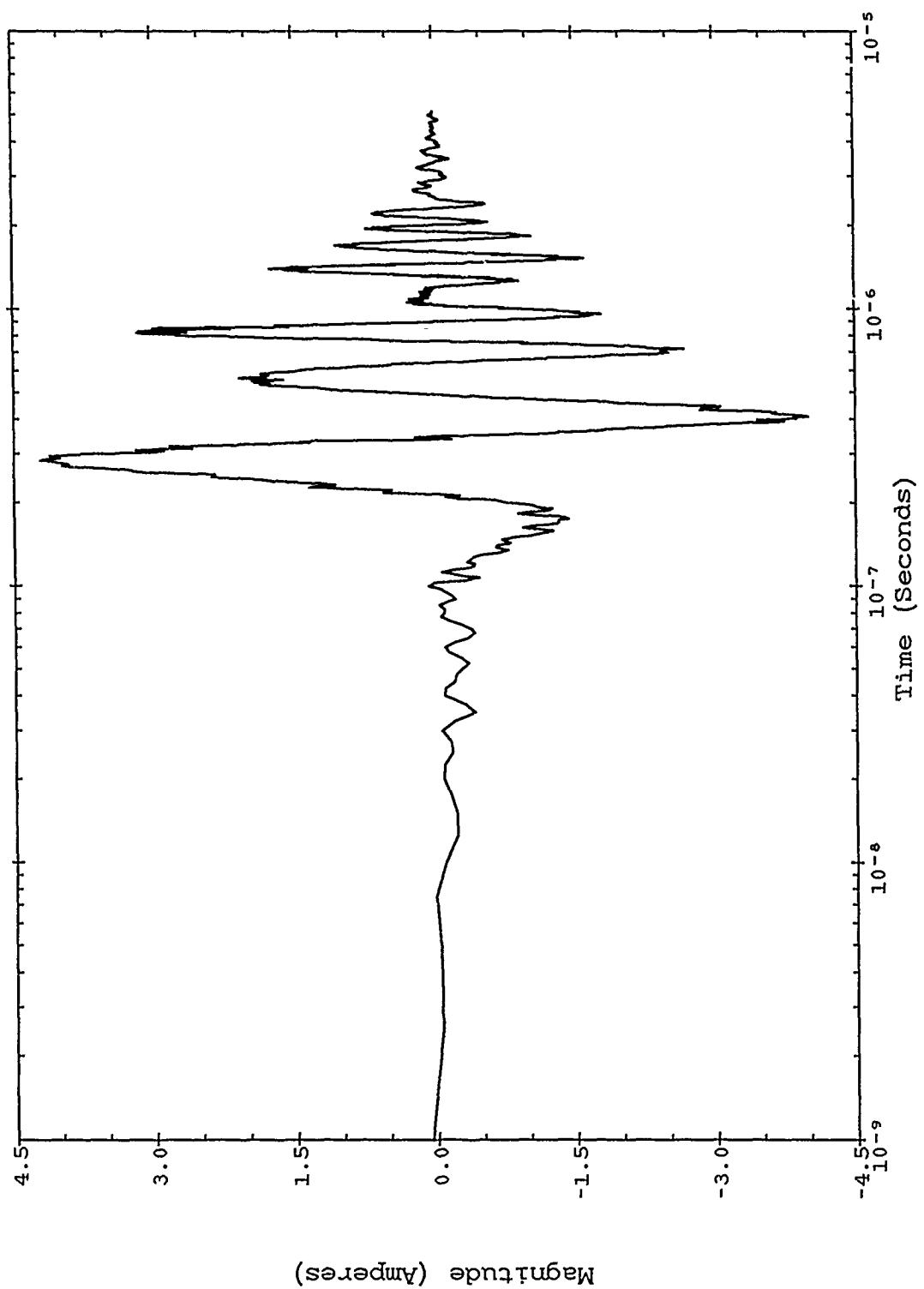


Figure B-120. Double exponential threat; TP 2866 SN 2274.

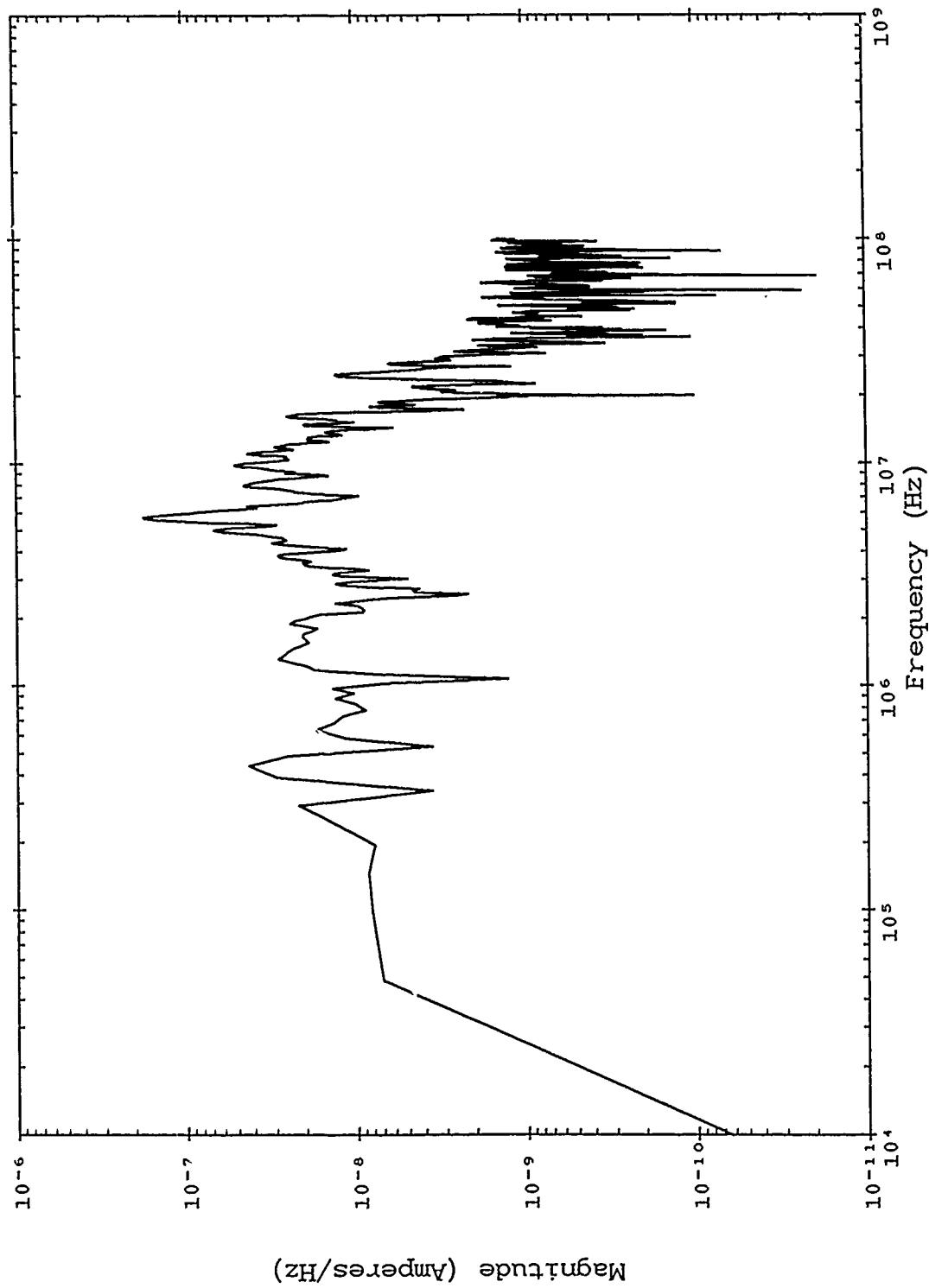


Figure B-121. Corrected TRESTLE data; TP 3313 SN 2521.

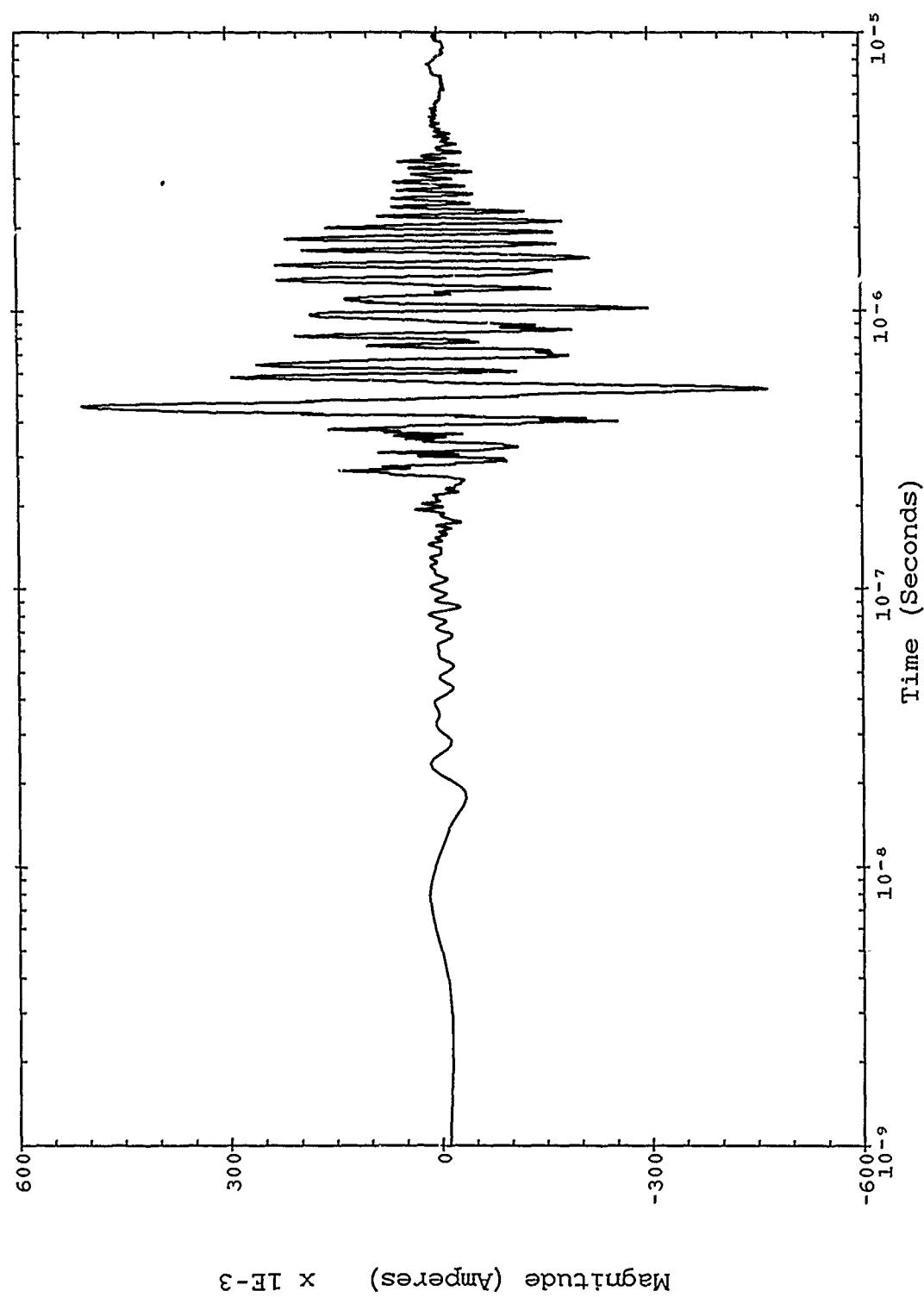


Figure B-122. Corrected TRESTLE data; TP 3313 SN 2521.

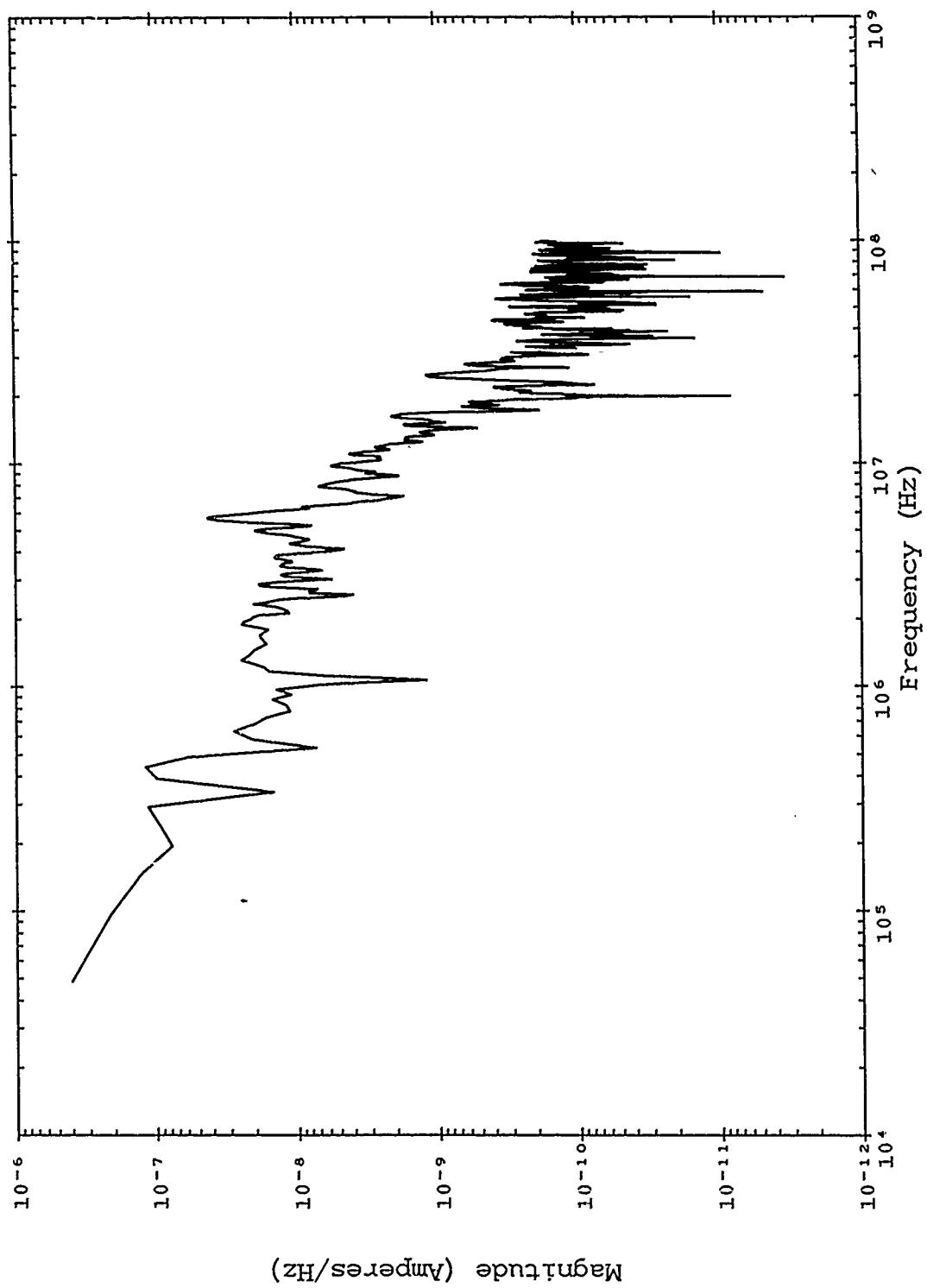


Figure B-123. Severe nearby lightning threat; TP 3313 SN 2521.

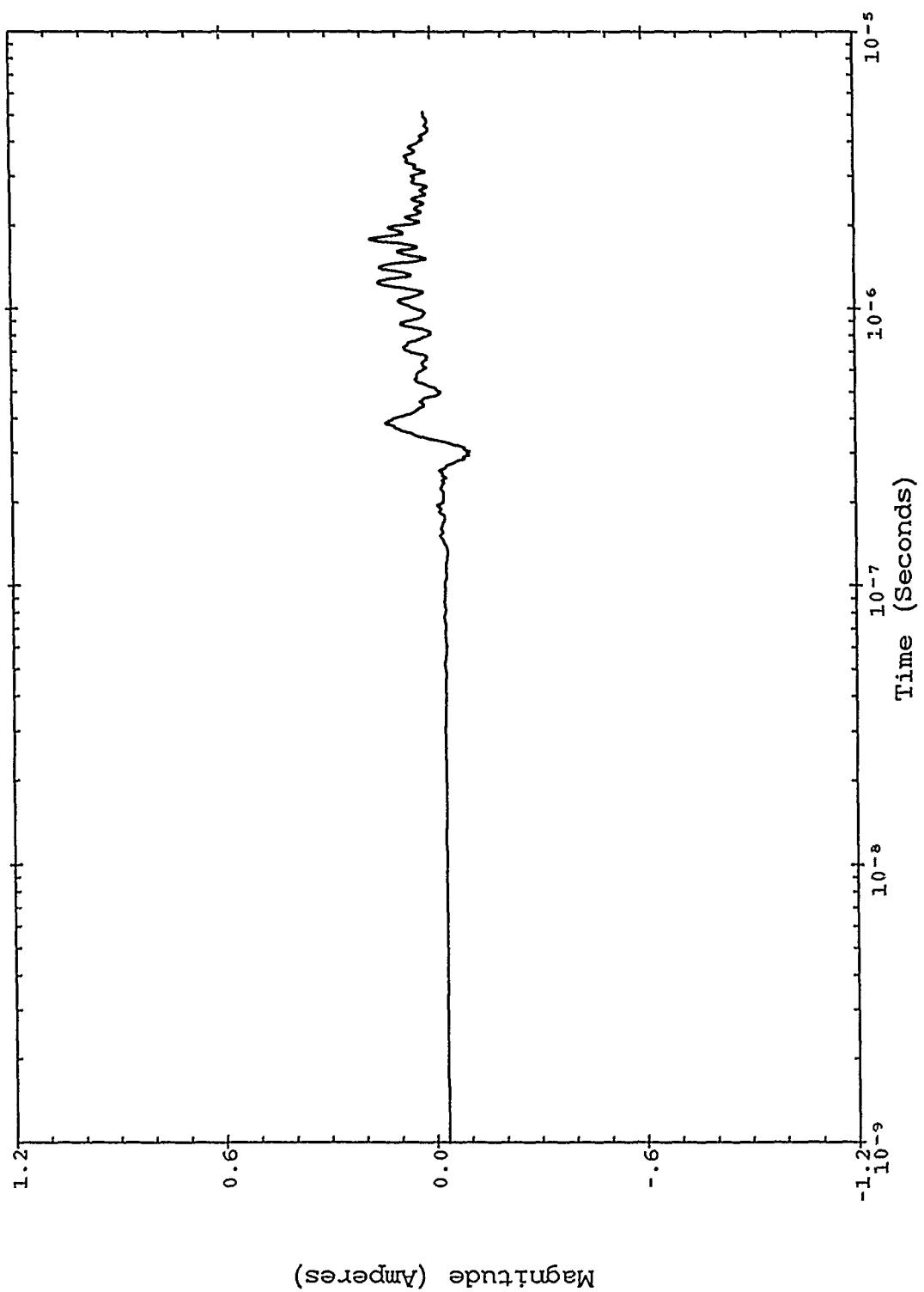


Figure B-124. Severe nearby lightning threat; TP 3313 SN 2521.

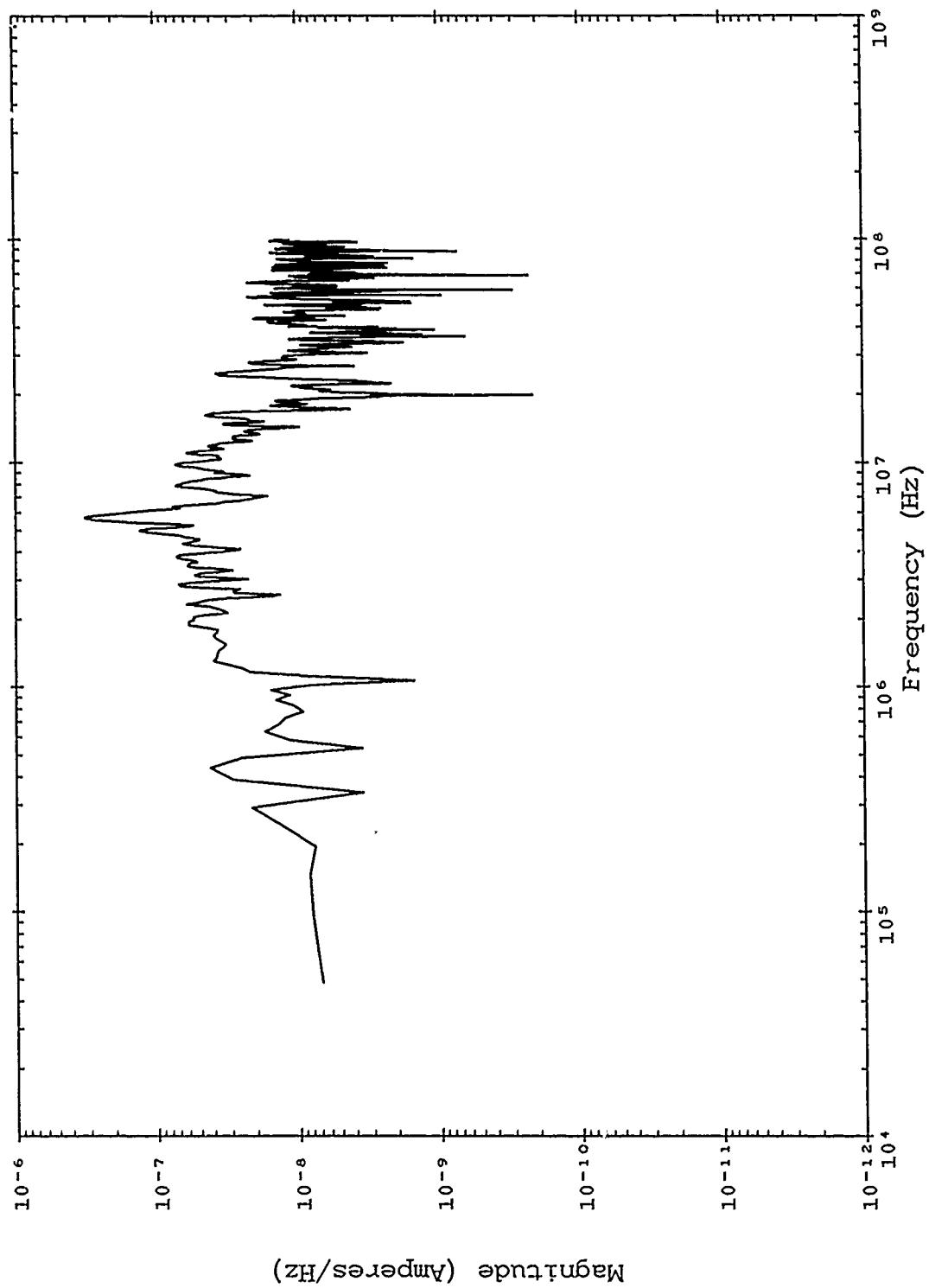


Figure B-125. Double exponential threat; TP 3313 SN 2521.

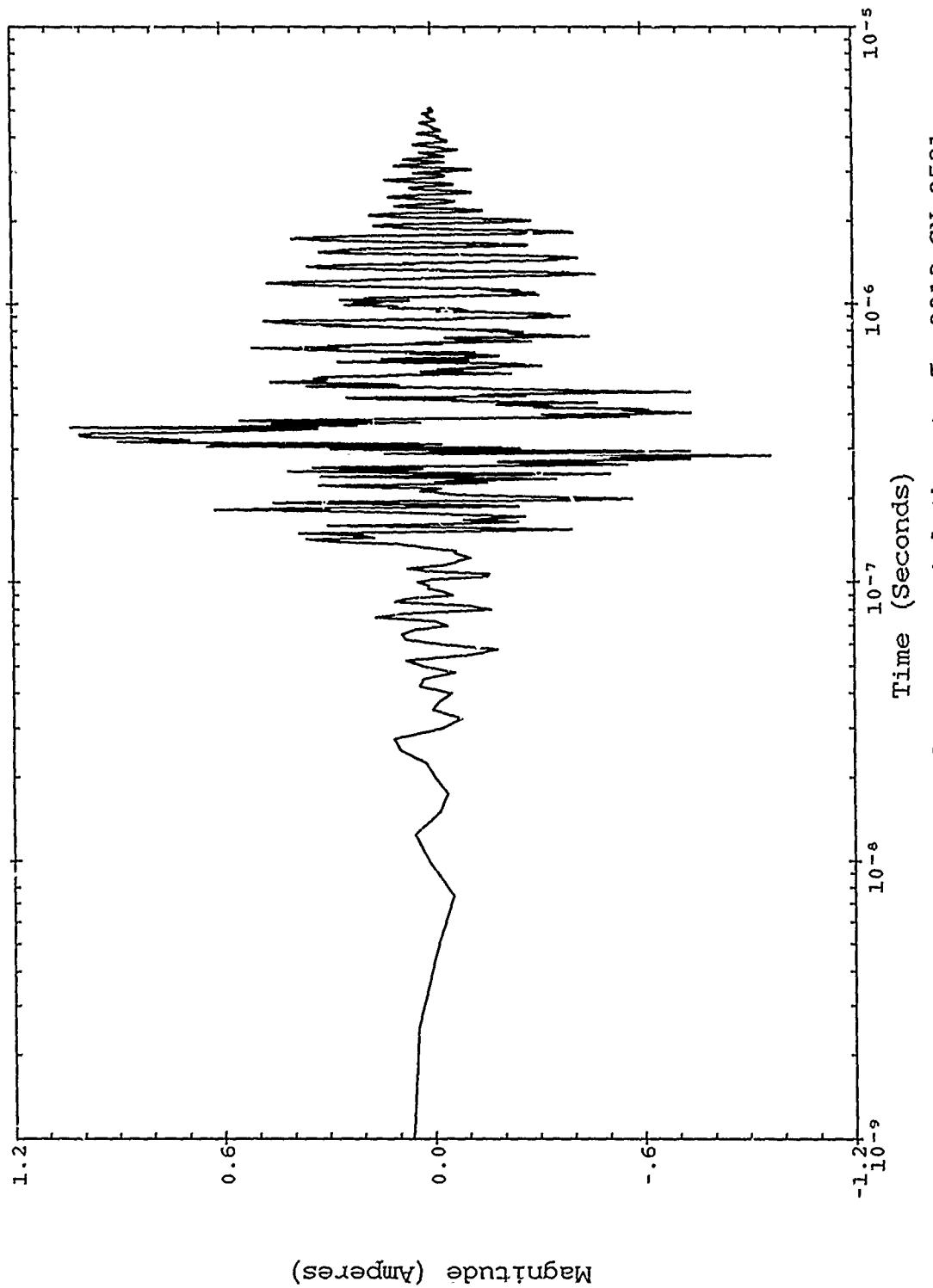


Figure B-126. Double exponential threat; T. 3313 SN 2521.

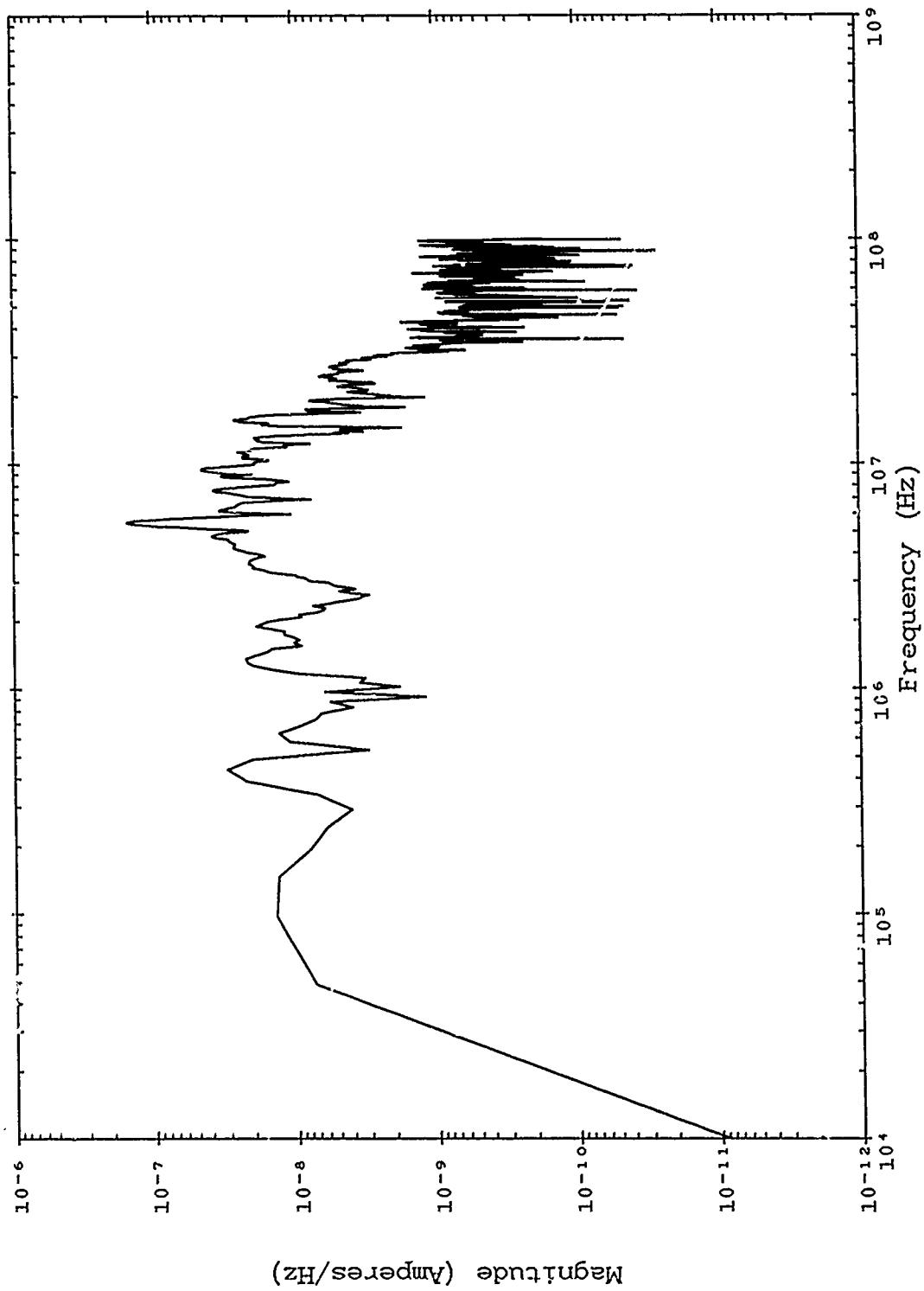


Figure B-127. Corrected TRESTLE data; TP 331.3 SN 2689.

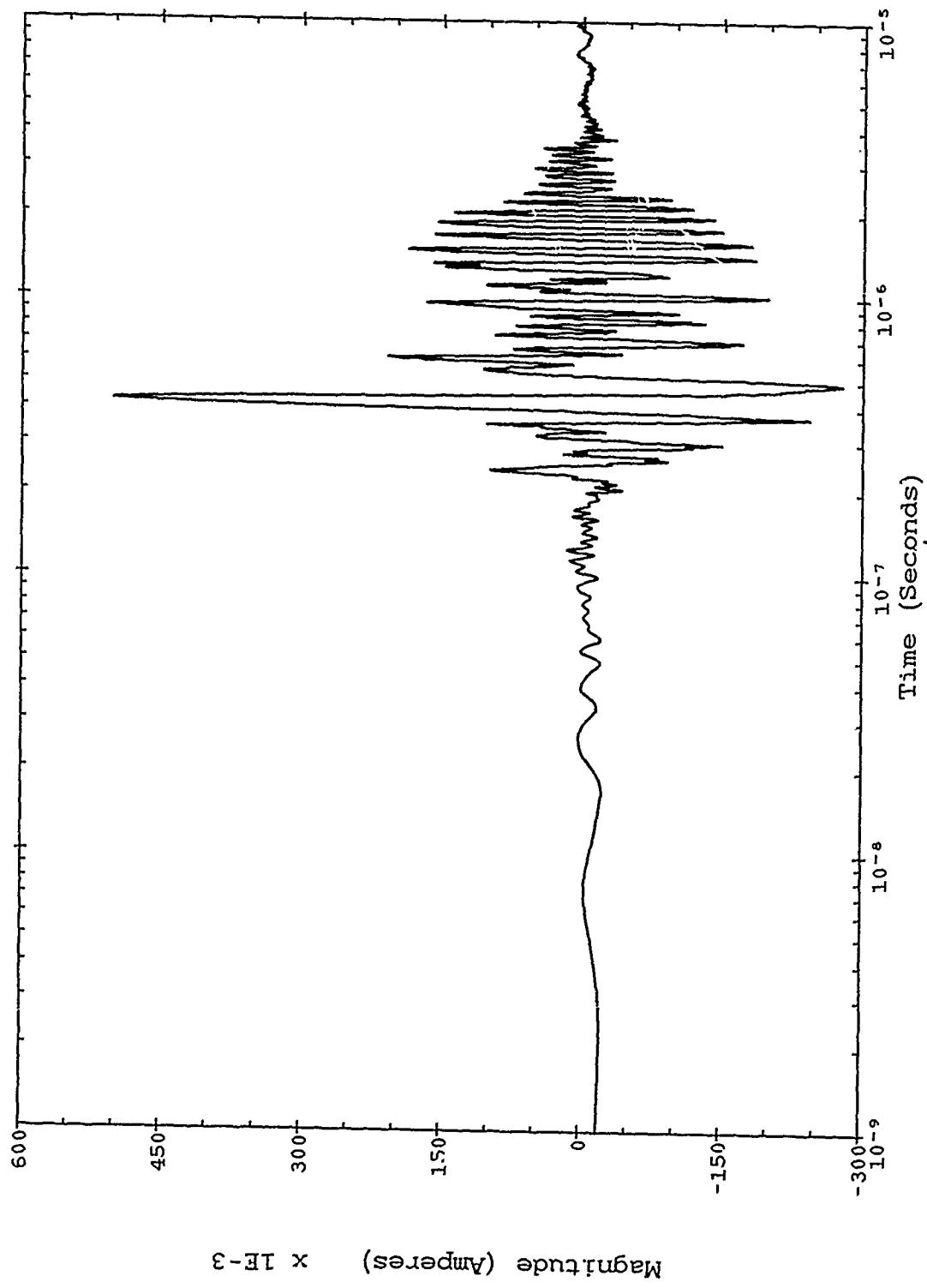


Figure B-128. Corrected TRESTLE data; TP 3313 SN 2689.

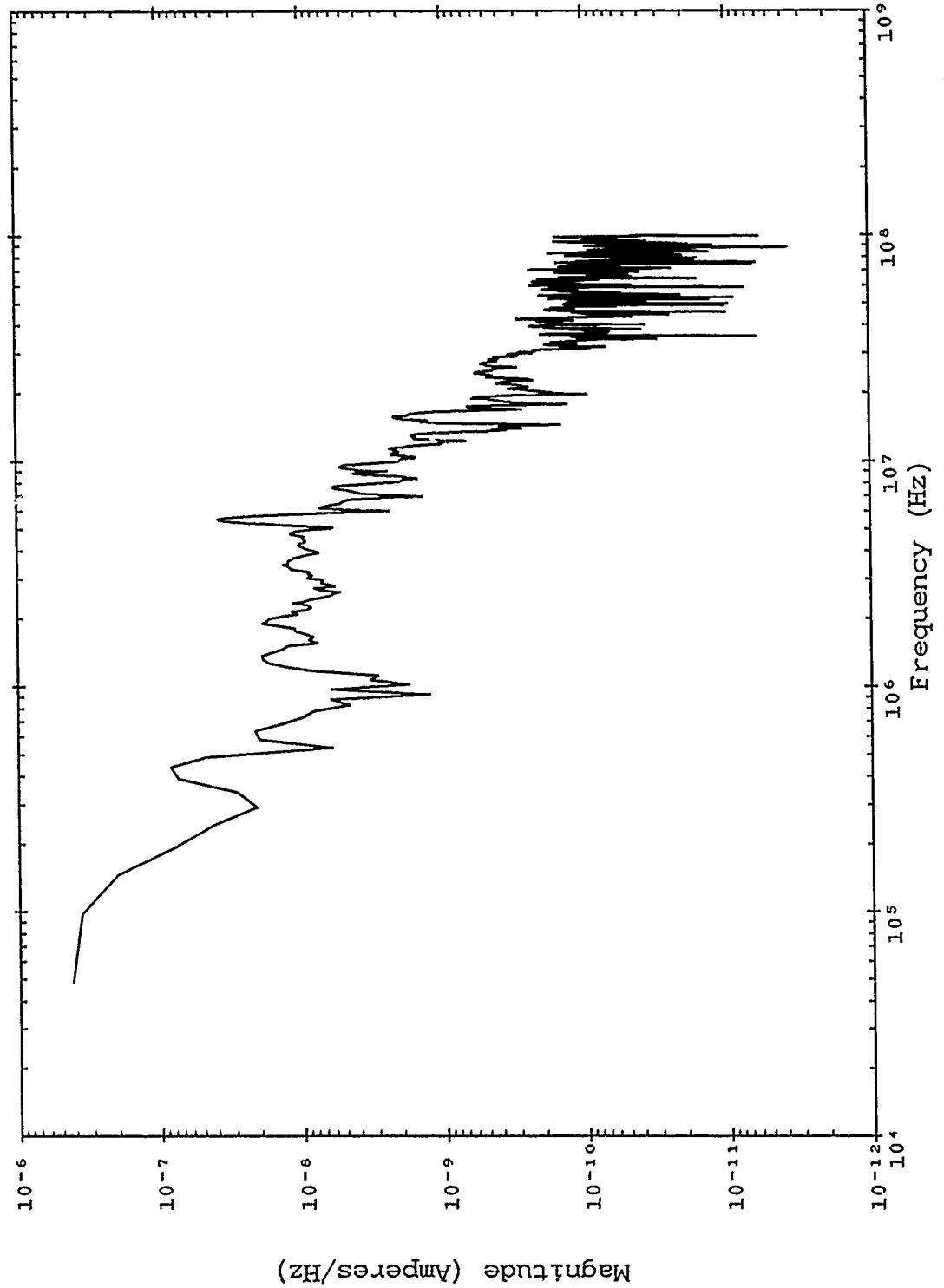


Figure B-129. Severe nearby lightning threat; TP 3313 SN 2689.

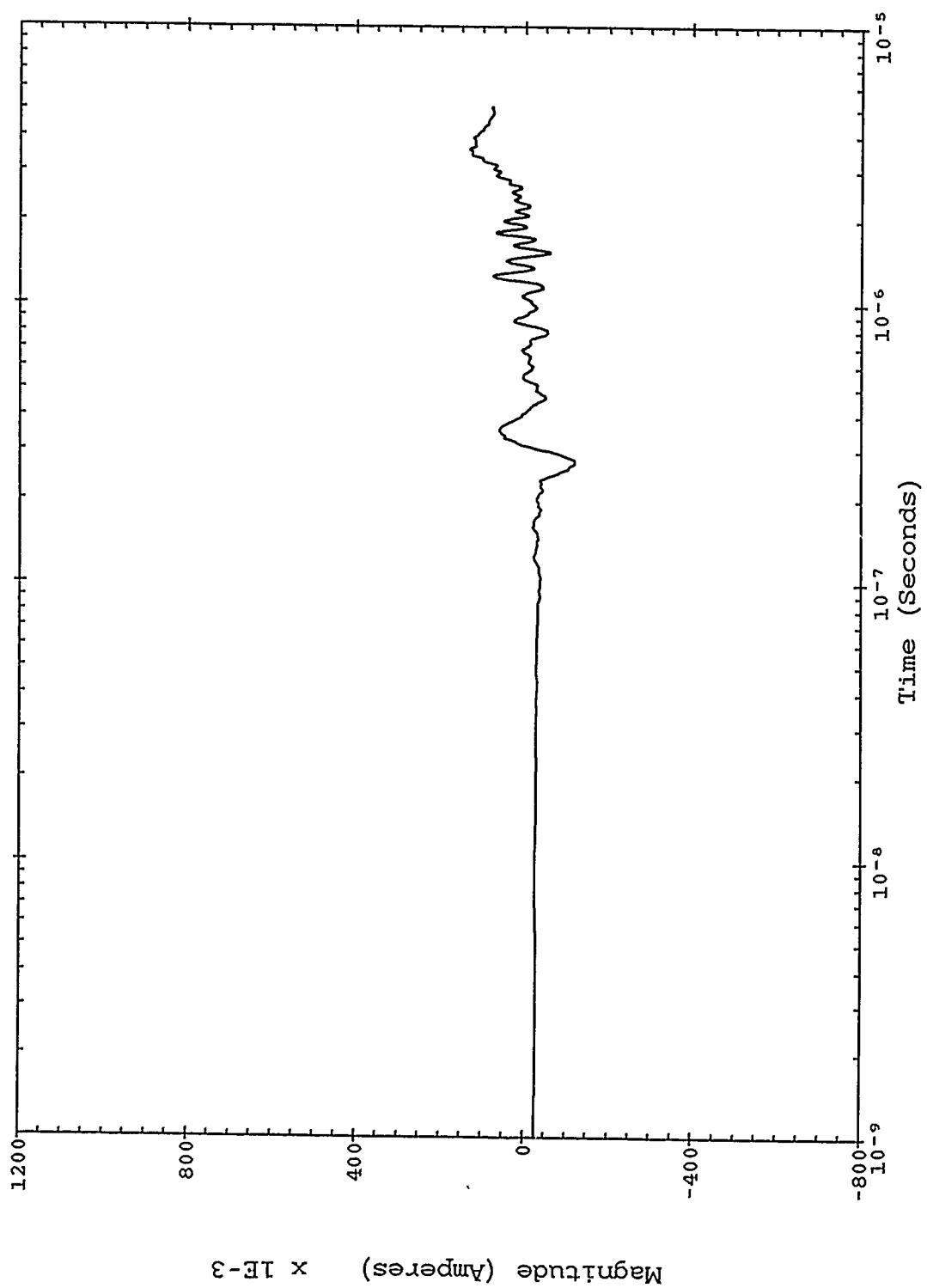


Figure B-130. Severe nearby lightning threat; TP 3313 SN 2689.

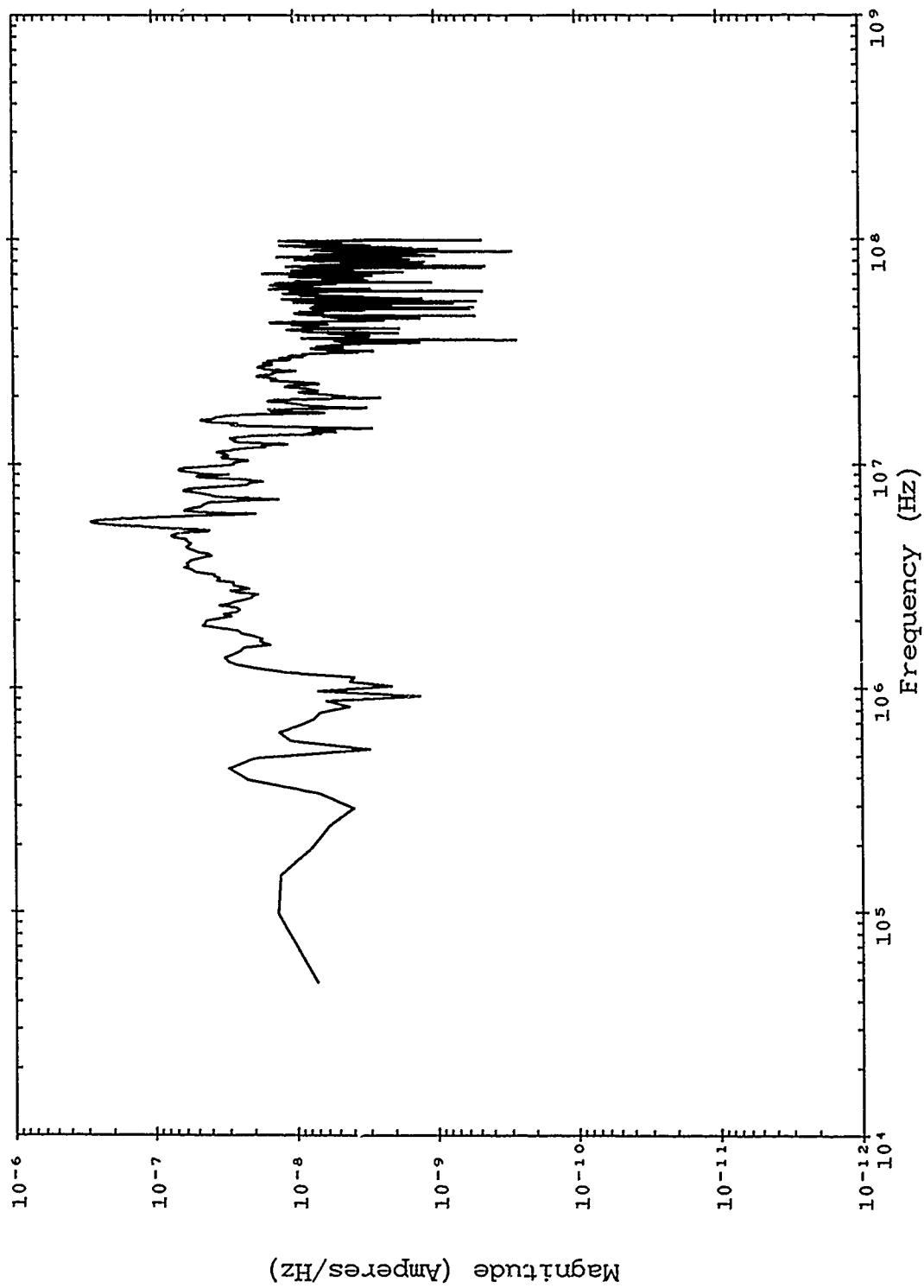


Figure B-131. Double exponential threat; TP 3313 SN 2689.

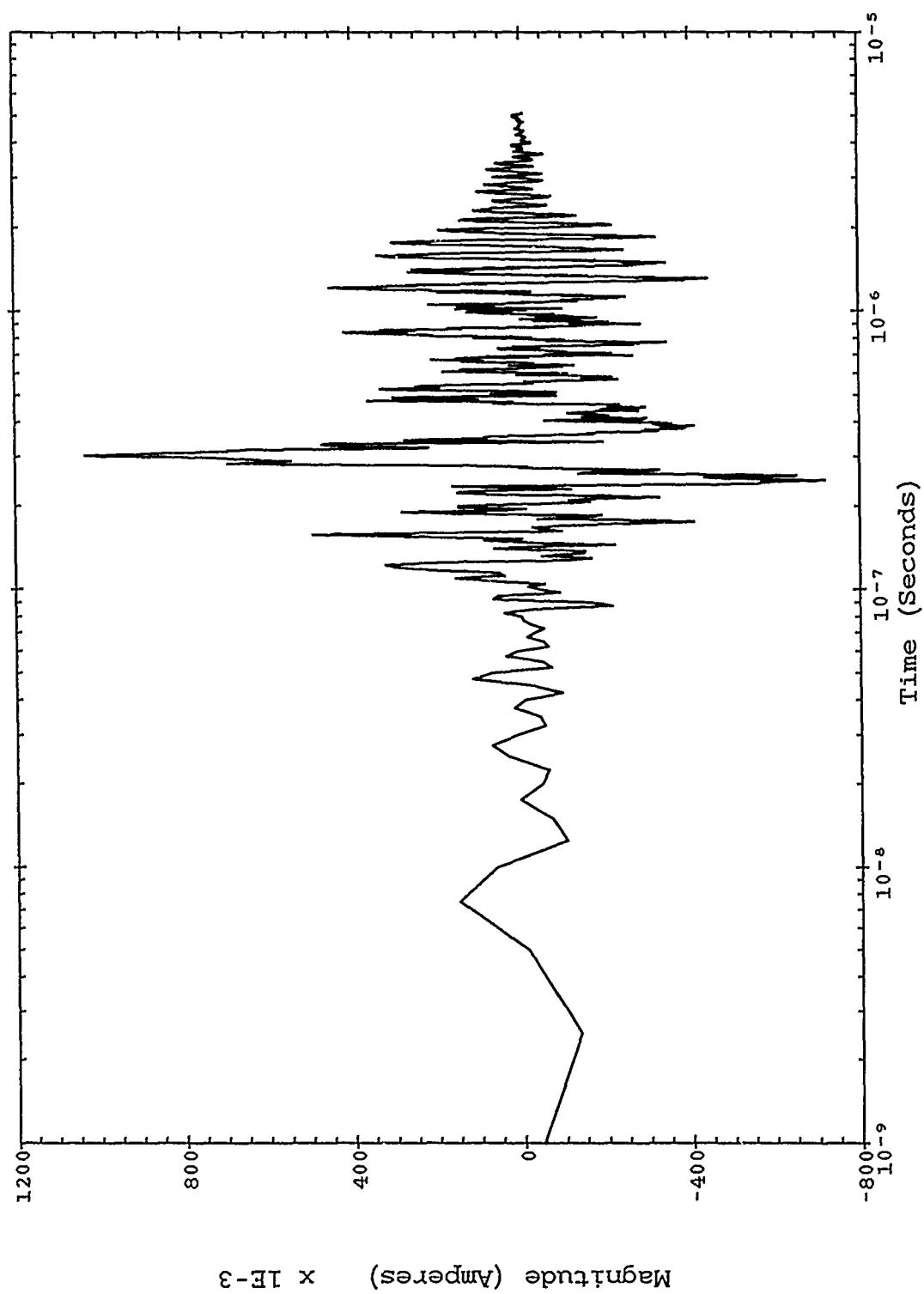


Figure B-132. Double exponential threat; TP 3313 SN 2689.

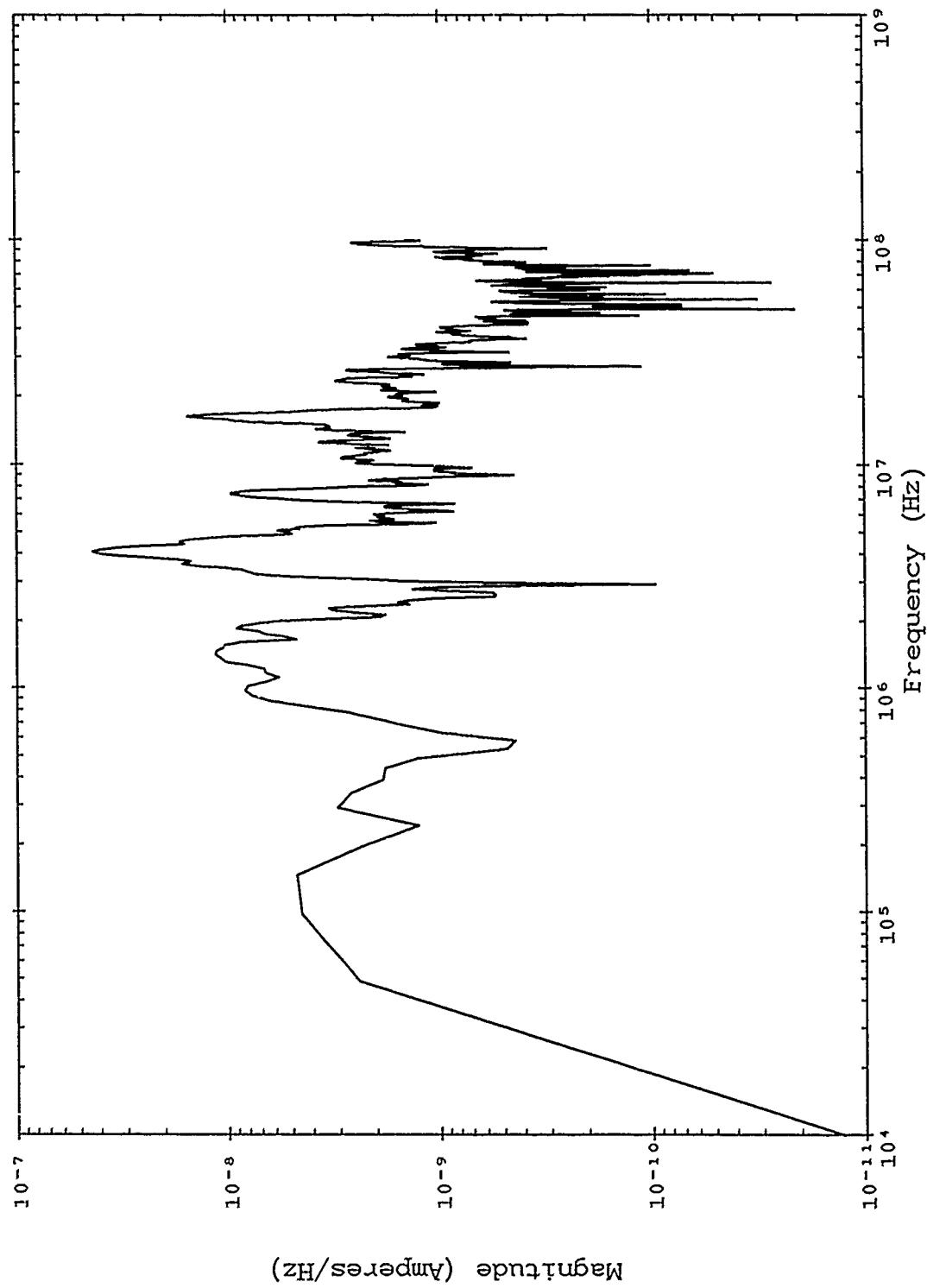


Figure B-133. Corrected TRESTLE data; TP 3385 SN 1718.

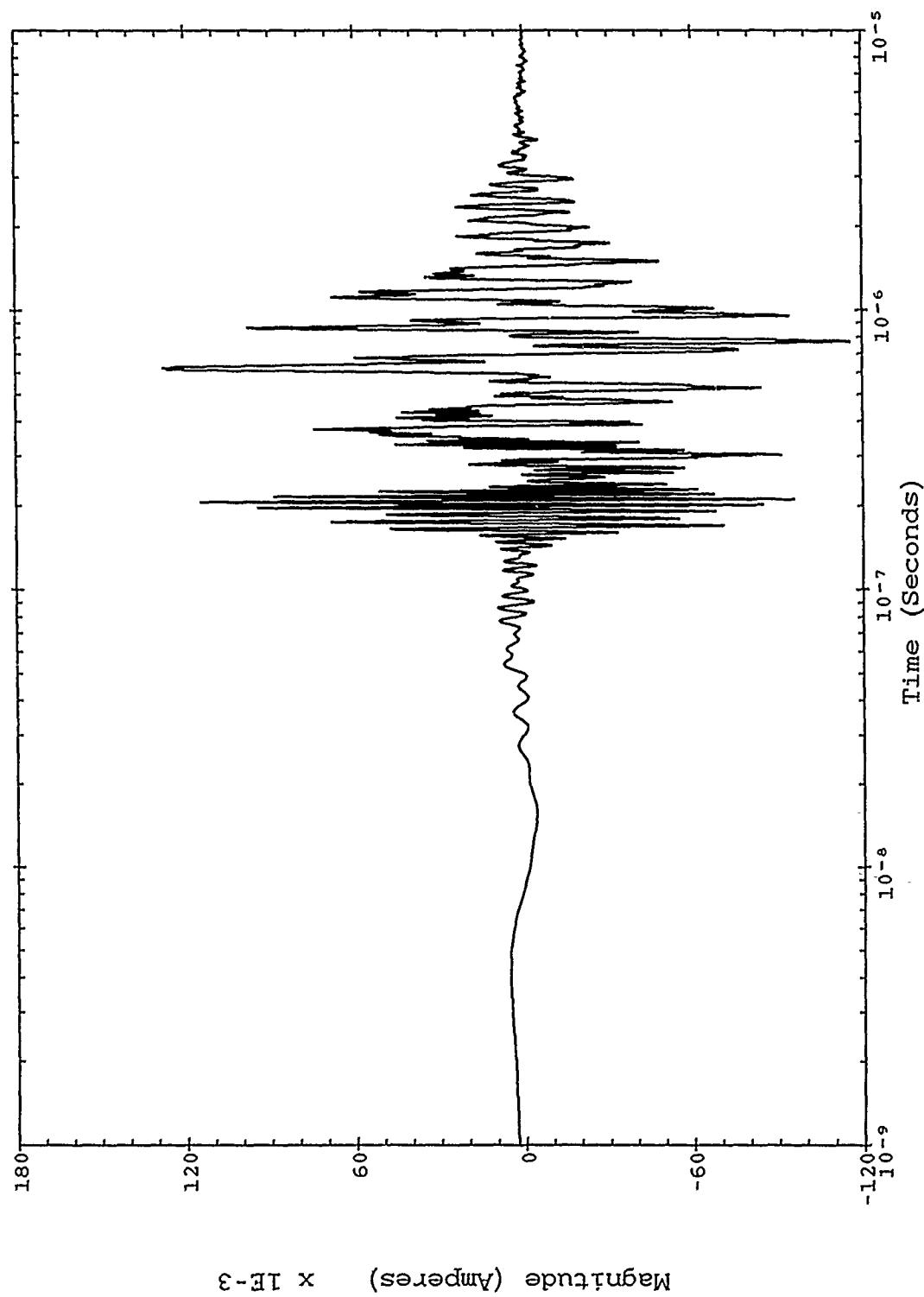


Figure B-134. Corrected TRESTLE data; TP 3385 SN 1718.

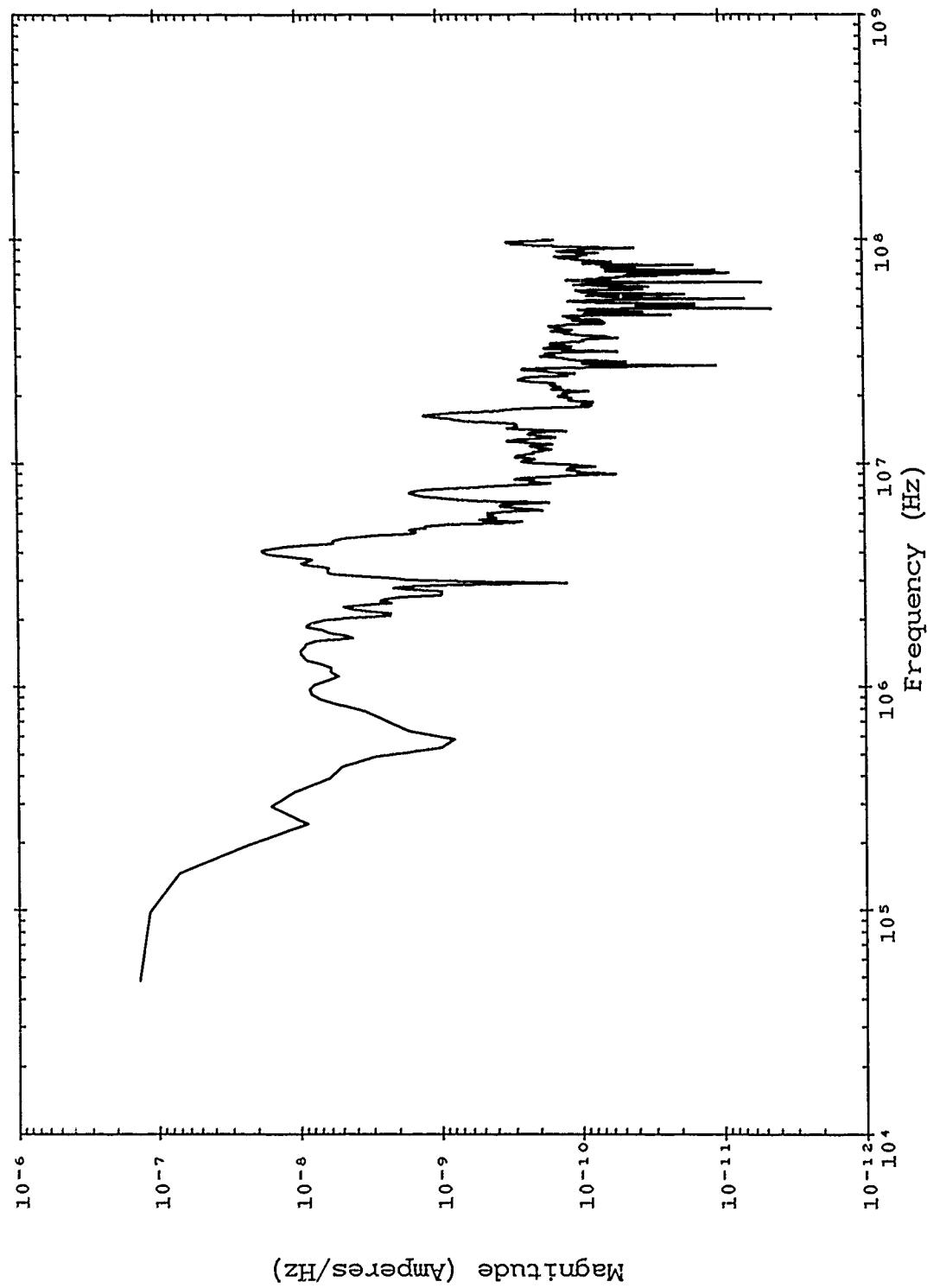


Figure B-135. Severe nearby lightning threat; TP 3385 SN 1718.

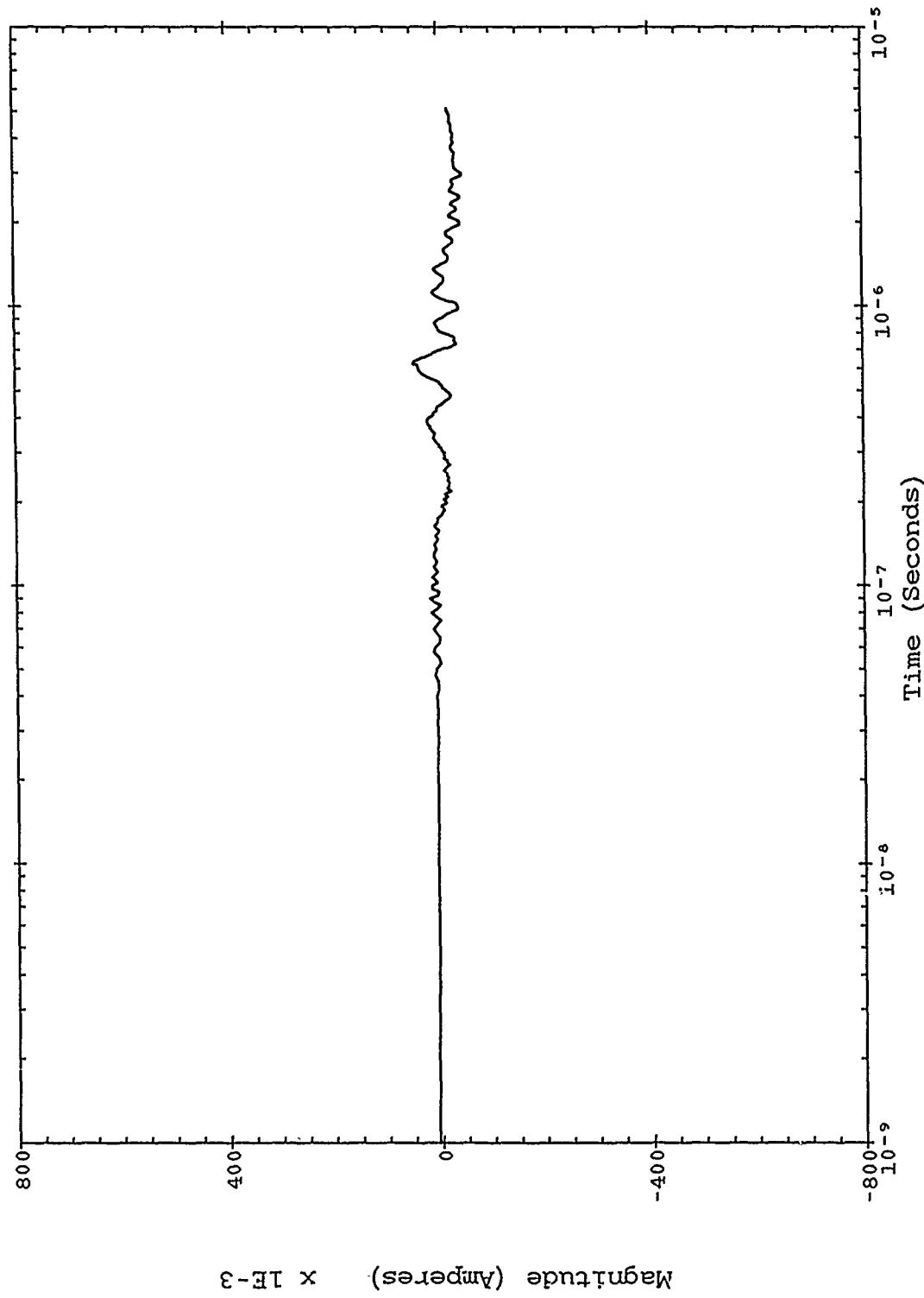


Figure B-136. Severe nearby lightning threat; TP 3385 SN 1718.

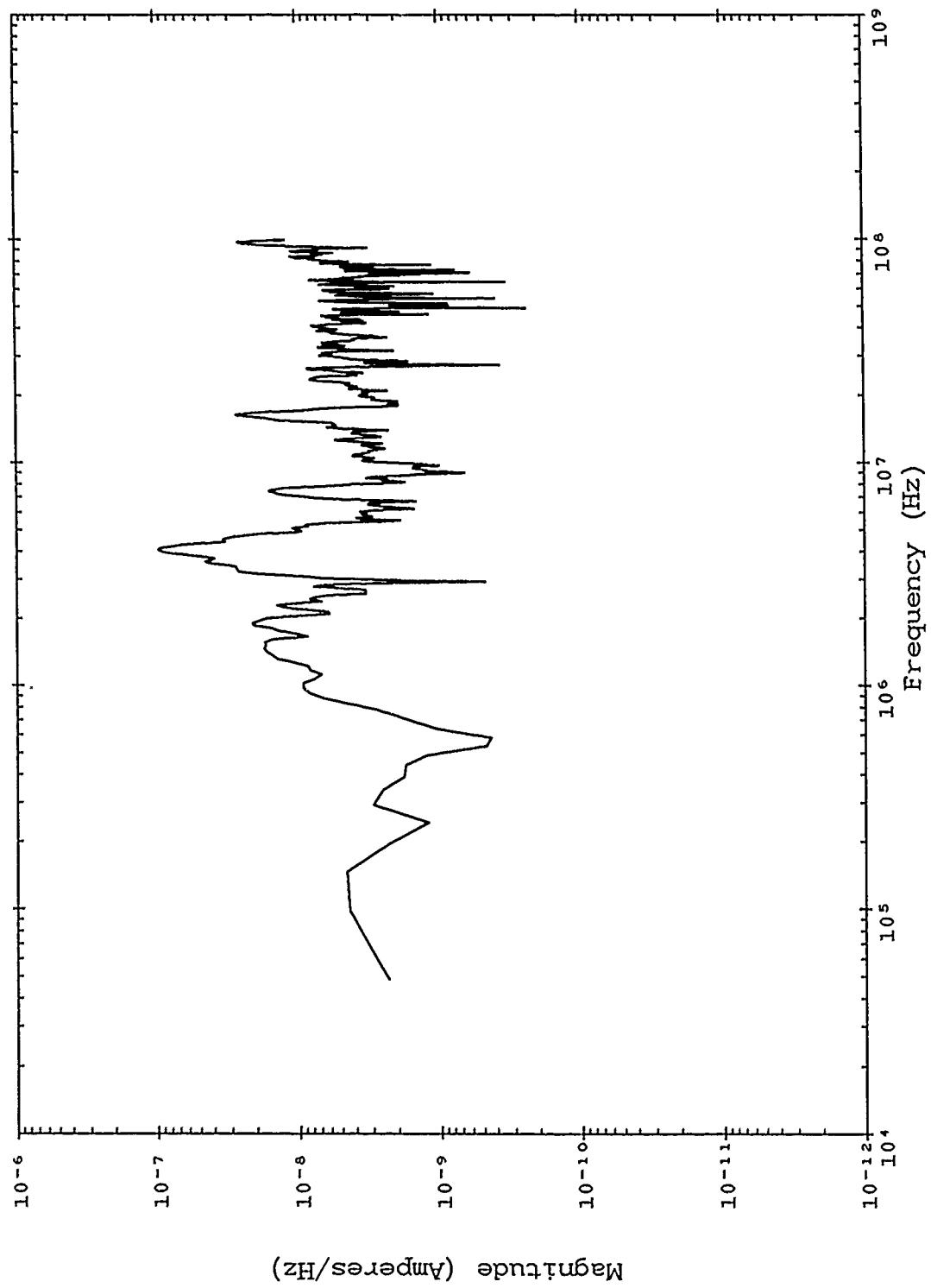


Figure B-137. Double exponential threat; TP 3385 SN 1718.

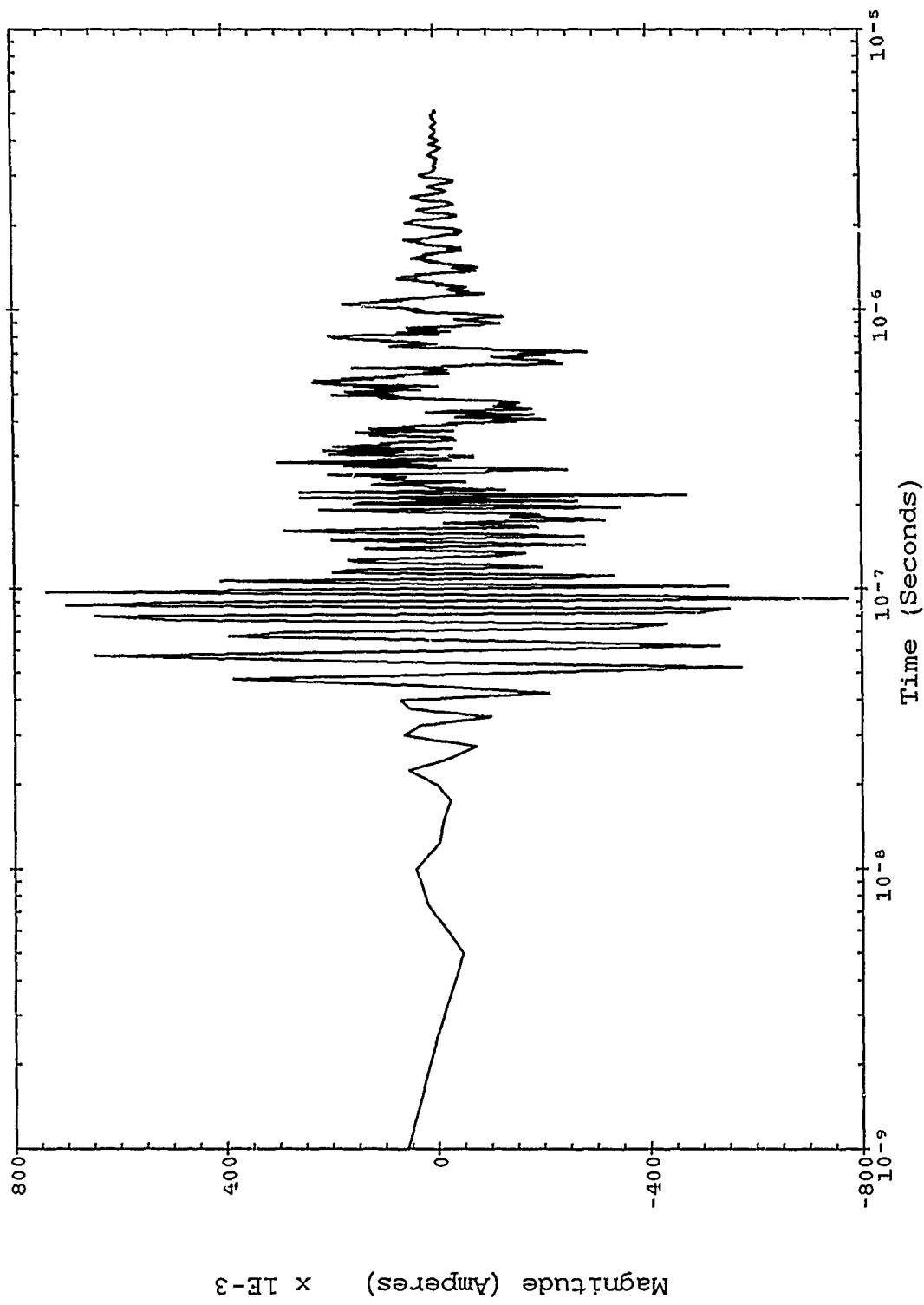


Figure B-138. Double exponential threat; TP 3385 SN 1718.

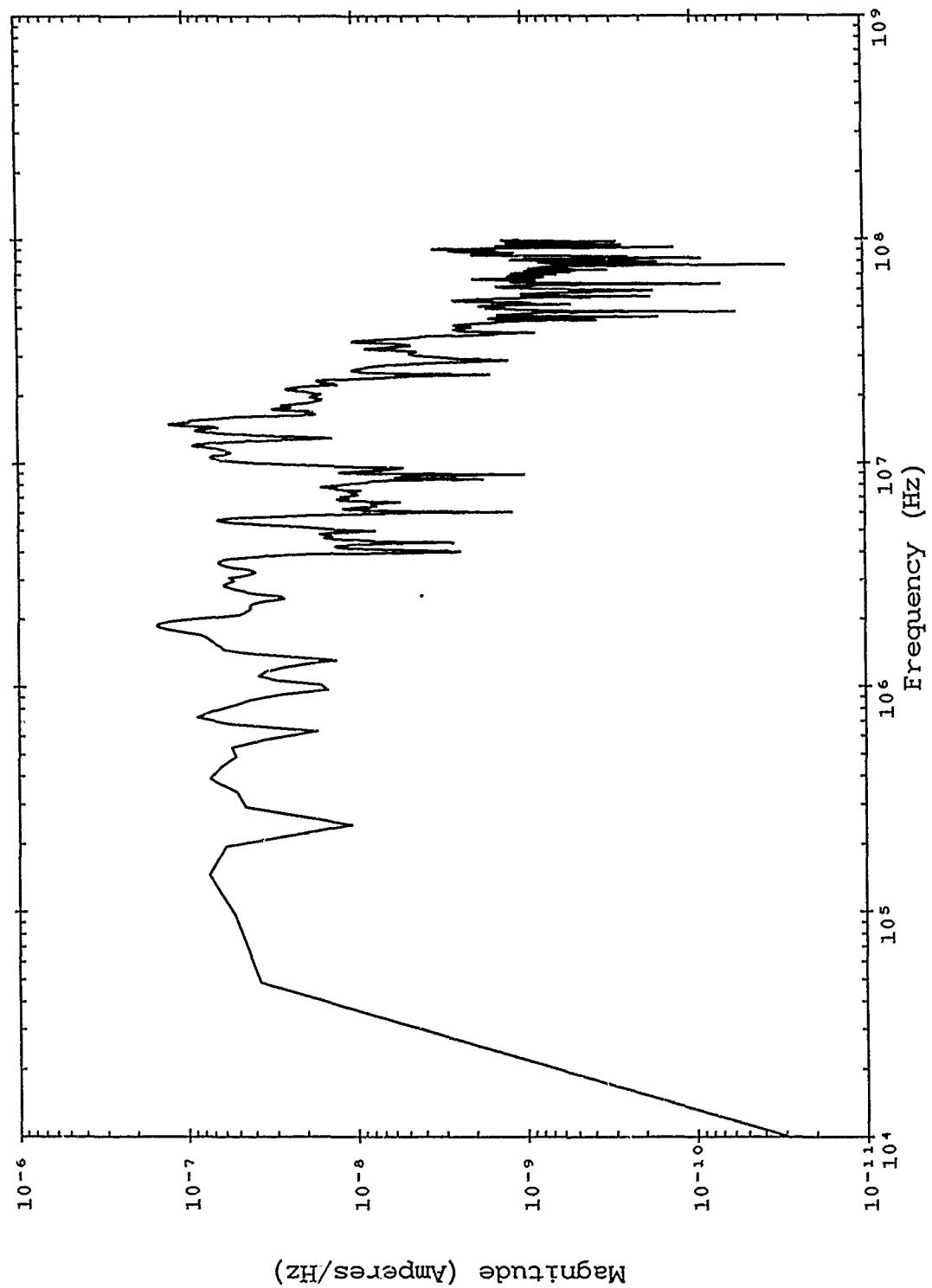


Figure B-139. Corrected TRESTLE data; TP 3473 SN 2607.

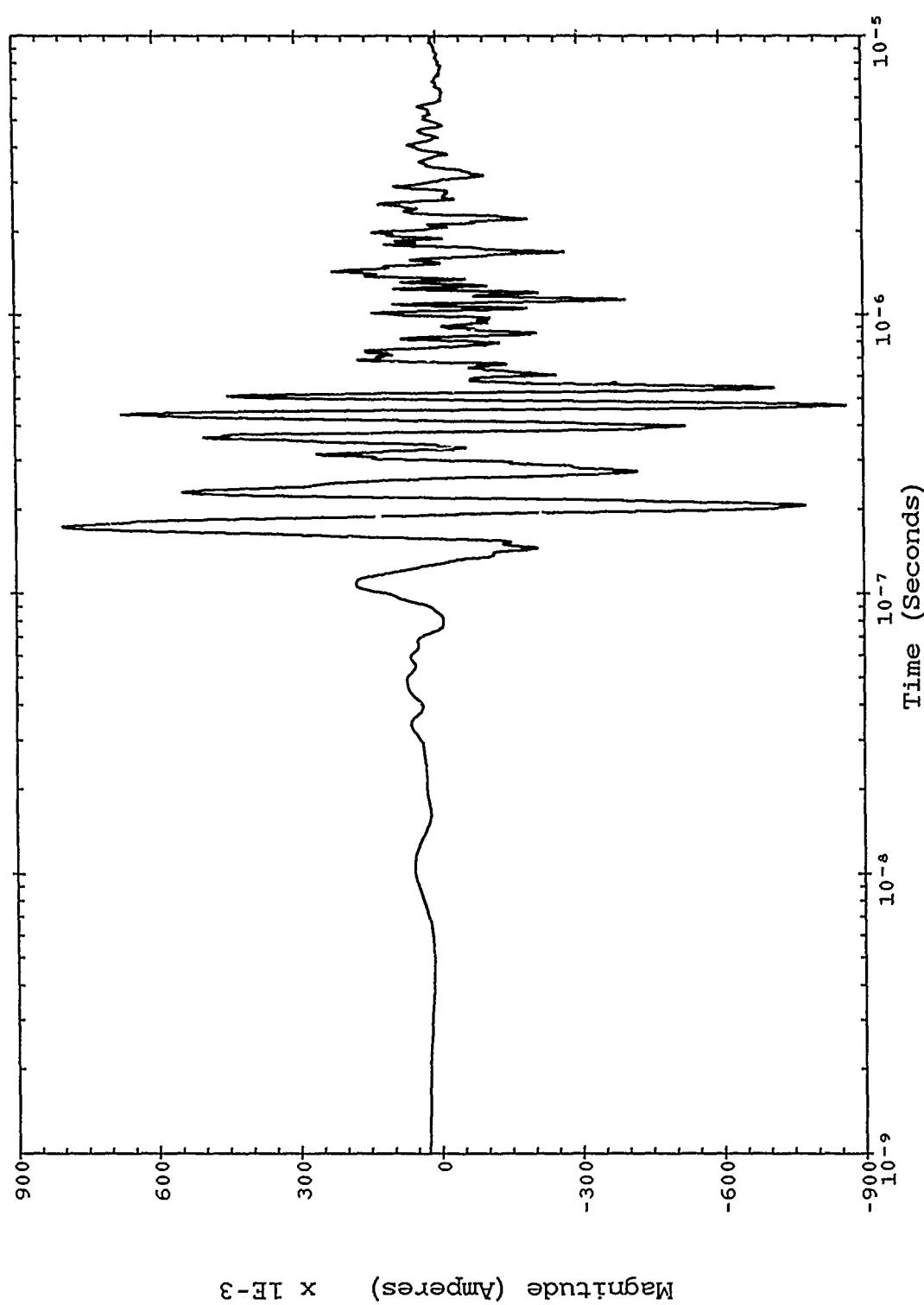


Figure B-140. Corrected TRESTLE data; TP 3473 SN 2607.

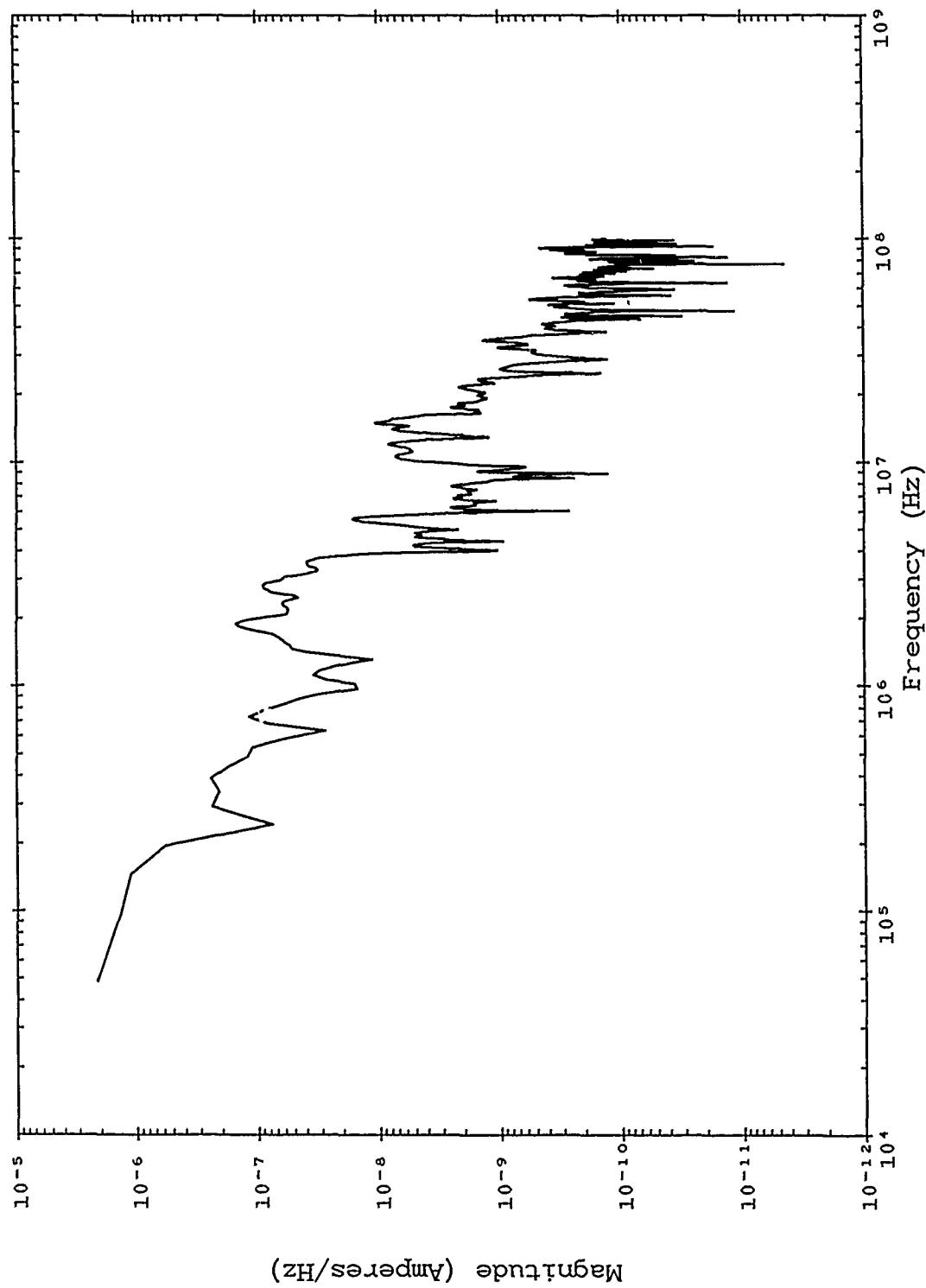


Figure B-141. Severe nearby lightning threat; TP 3473 SN 2607.

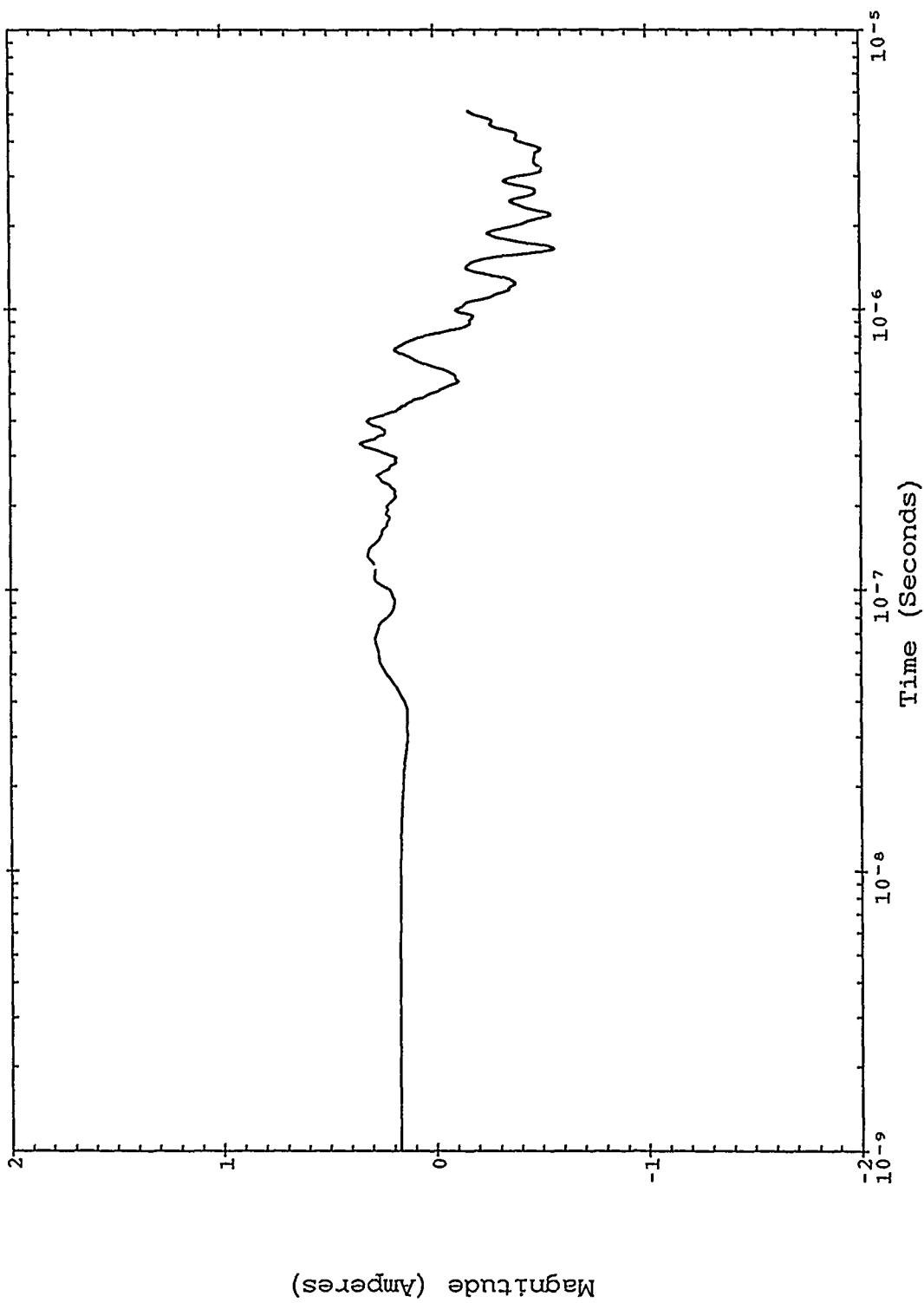


Figure B-142. Severe nearby lightning threat; TP 3473 SN 2607.

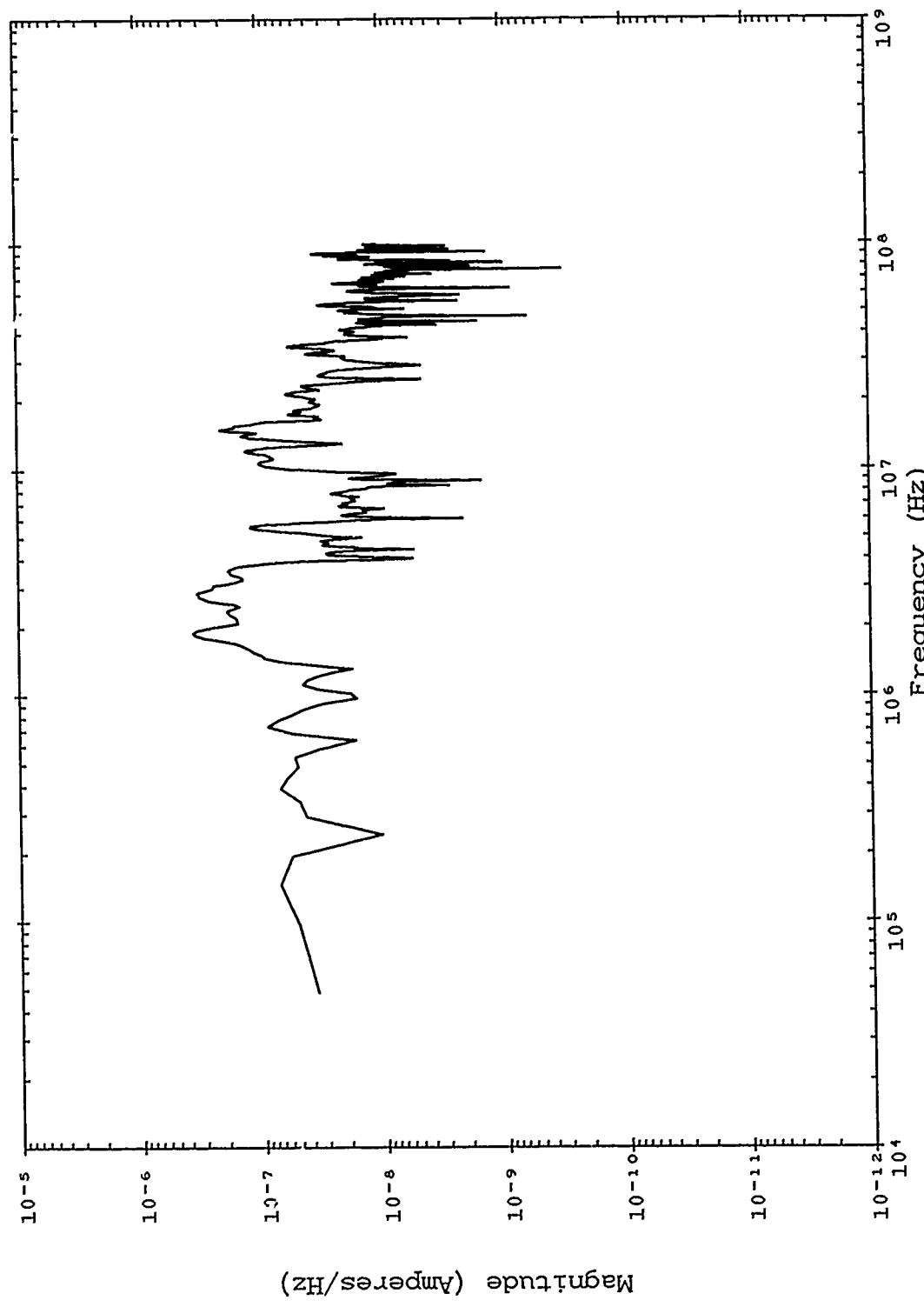


Figure B-143. Double exponential threat; TP 3473 SN 2607.

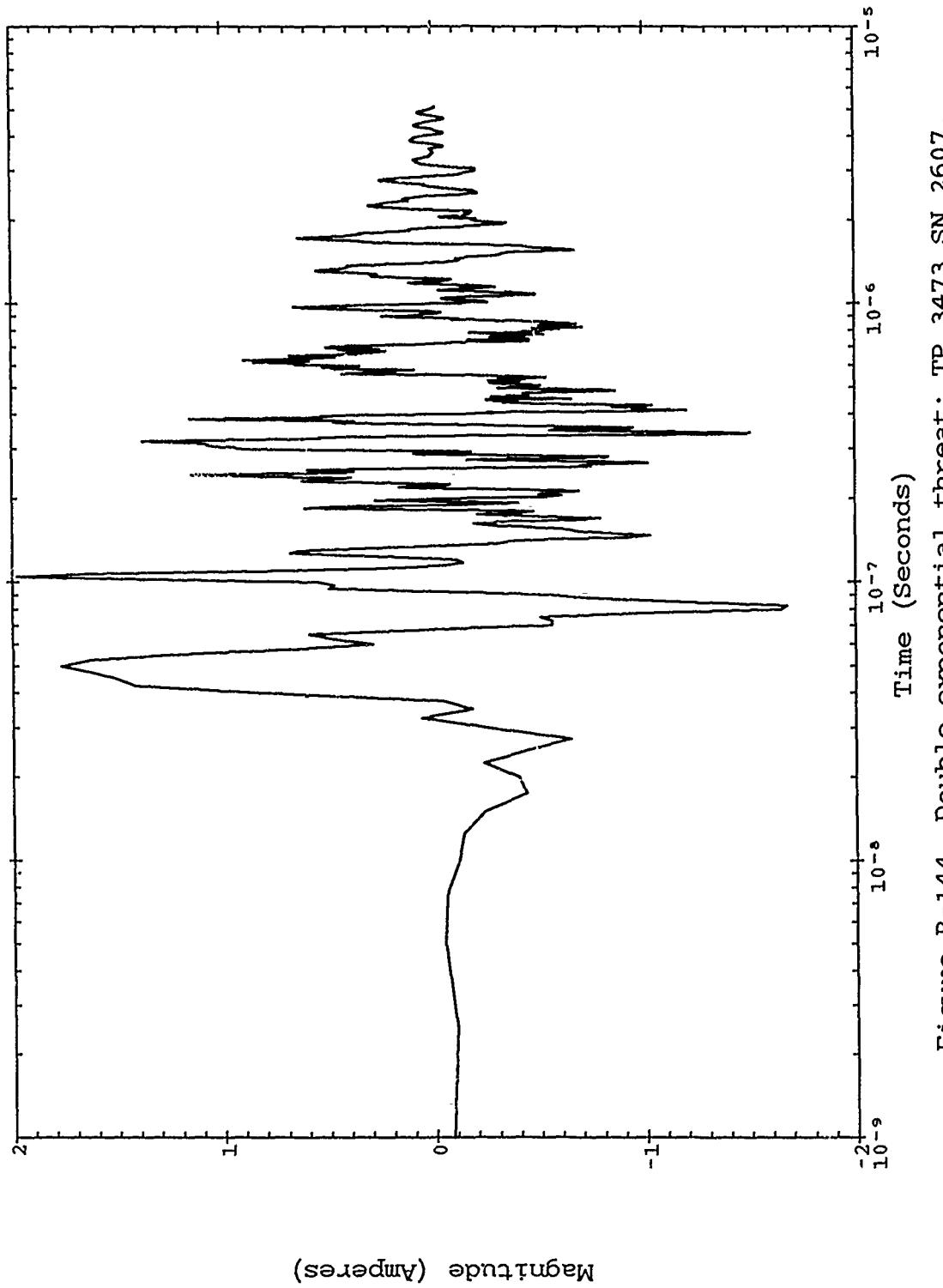


Figure B-144. Double exponential threat; TP 3473 SN 2607.

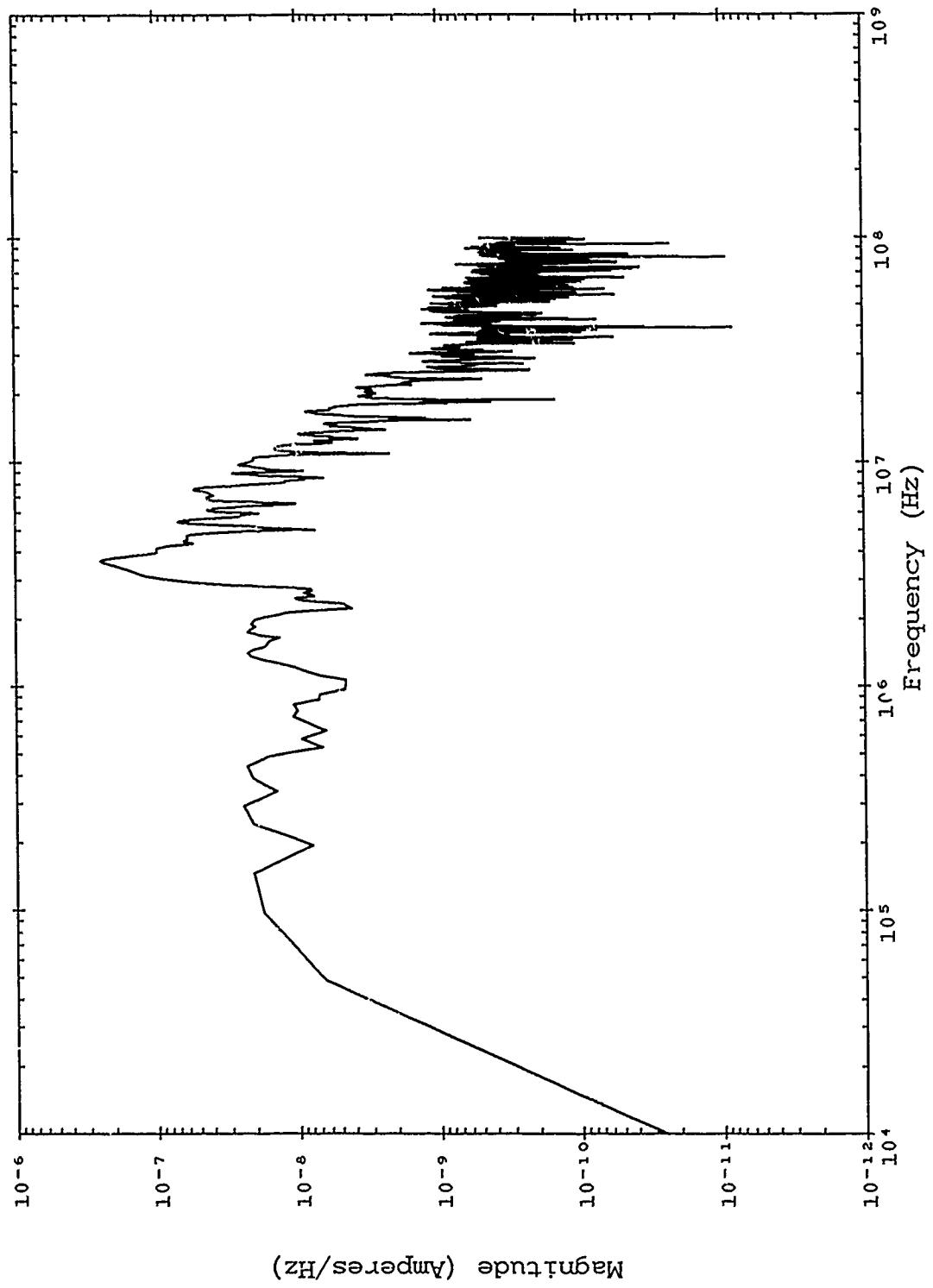


Figure B-145. Corrected TRESTLE data; TP 3539 SN 2727.

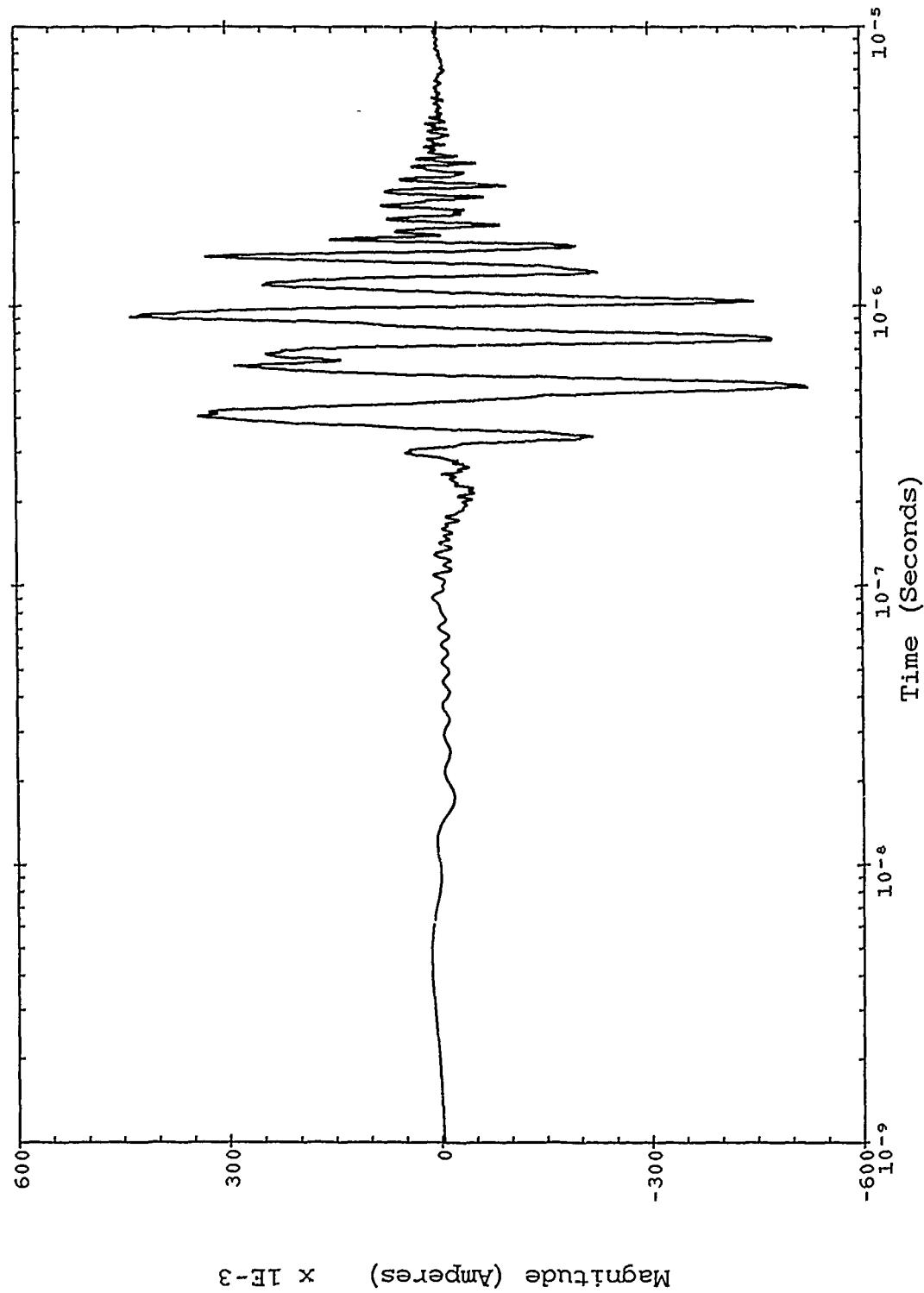


Figure B-146. Corrected TRESTLE data; TP 3539 SN 2727.

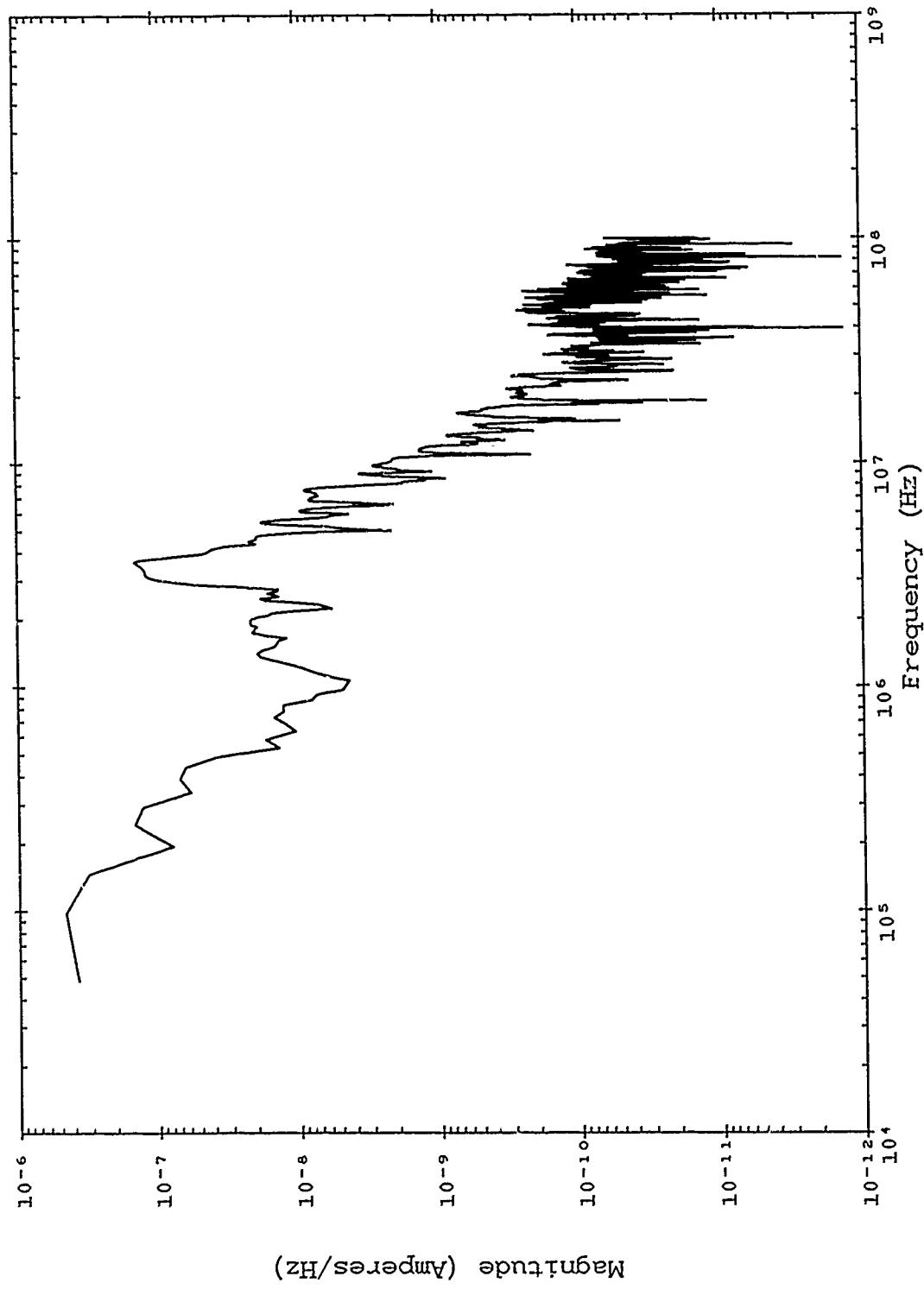


Figure B-147. Severe nearby lightning threat; TP 3539 SN 2727.

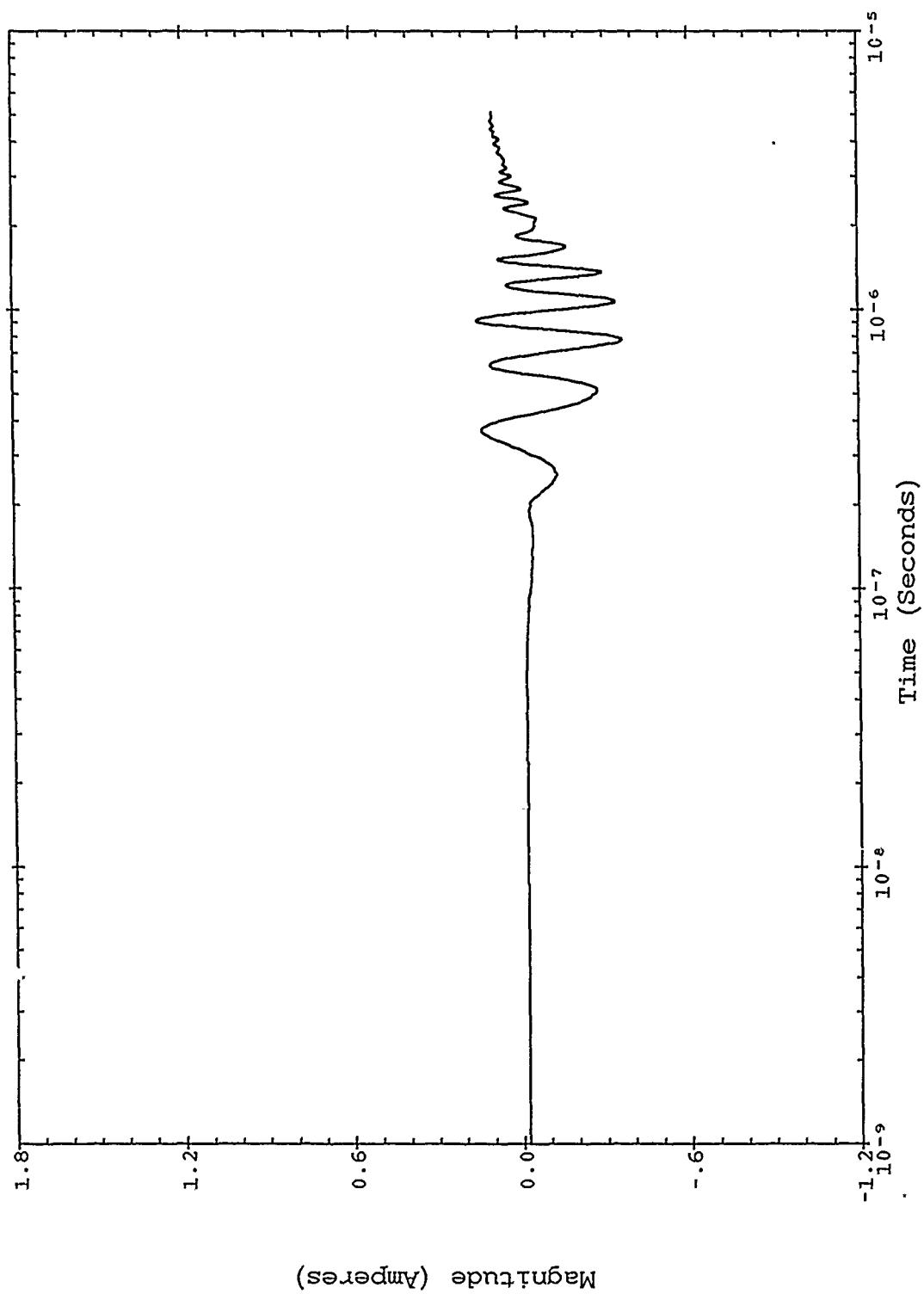


Figure B-148. Severe nearby lightning threat; TP 3539 SN 2727.

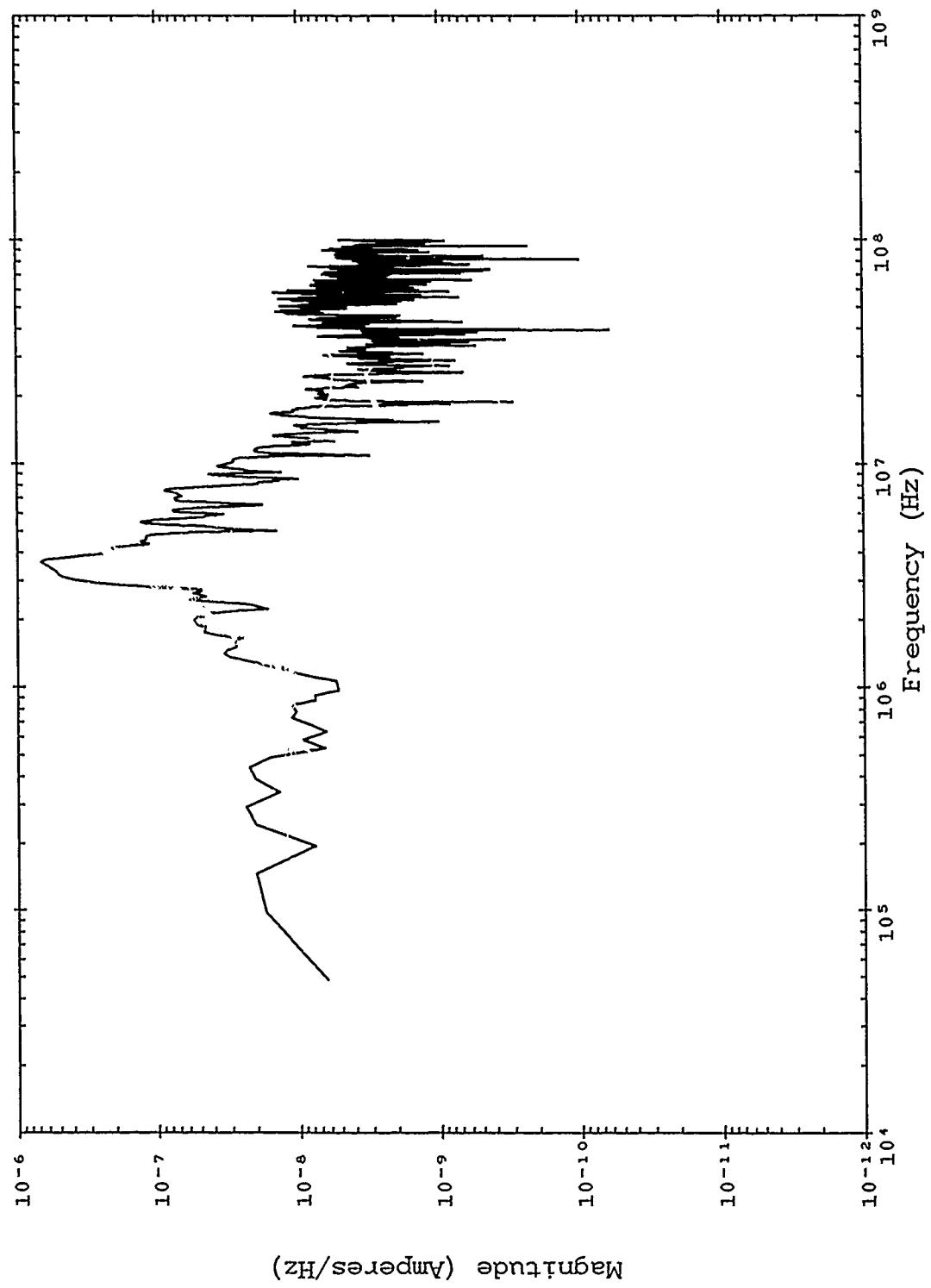


Figure B-149. Double exponential threat; TP 3539 SN 2727.

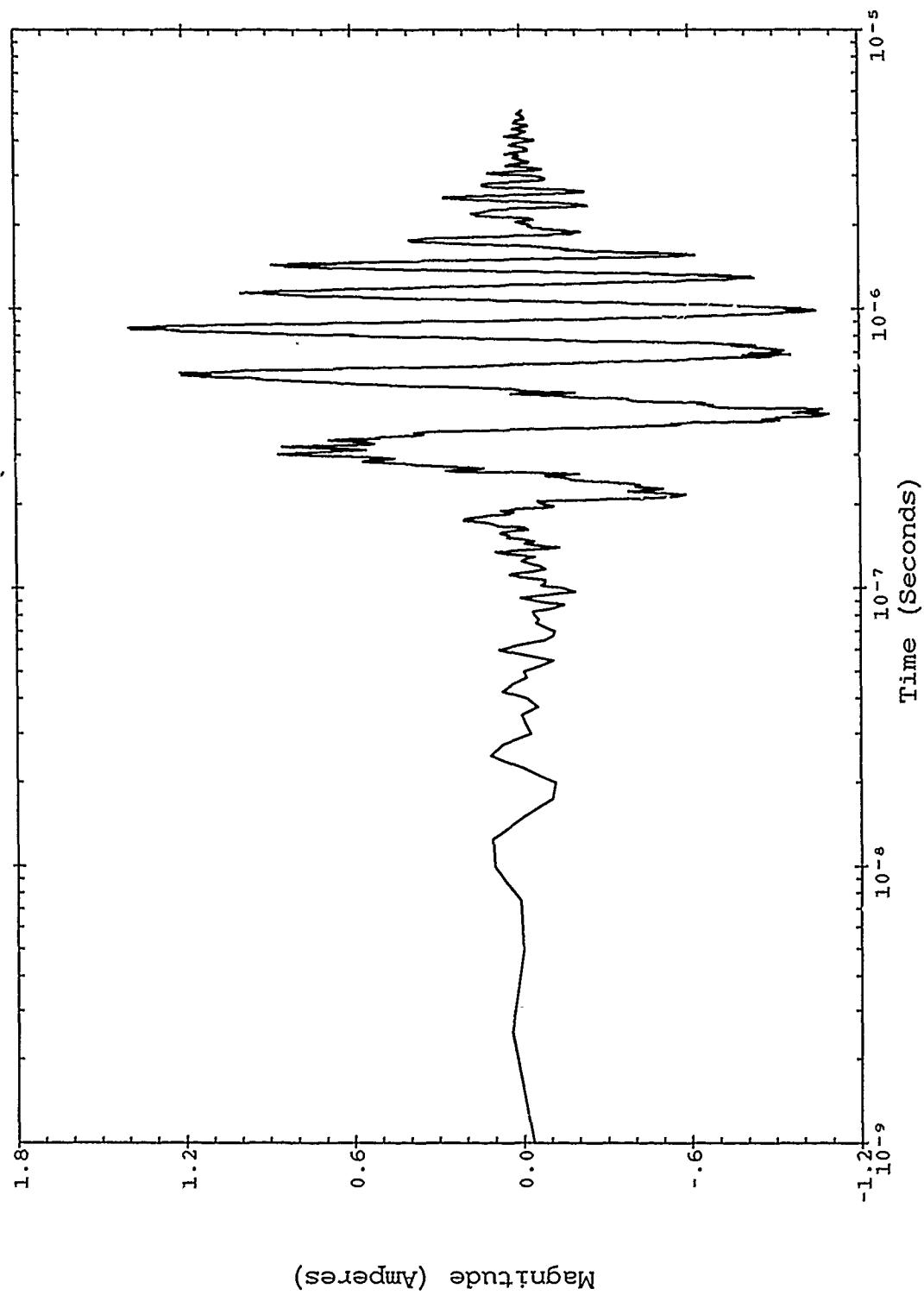


Figure B-150. Double exponential threat; TP 3539 SN 2727.

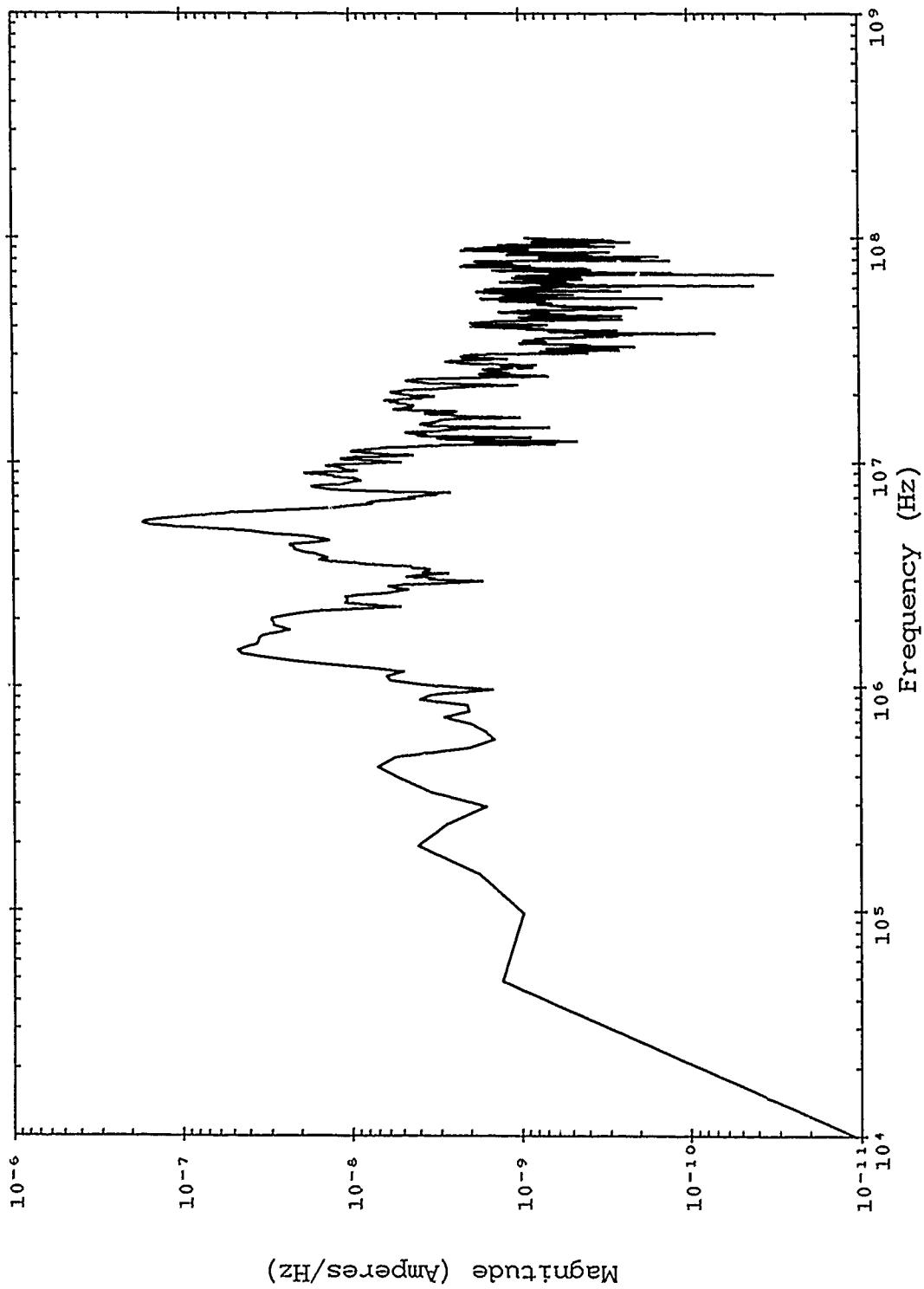


Figure B-151. Corrected TRESTLE data; TP 3543 SN 2265.

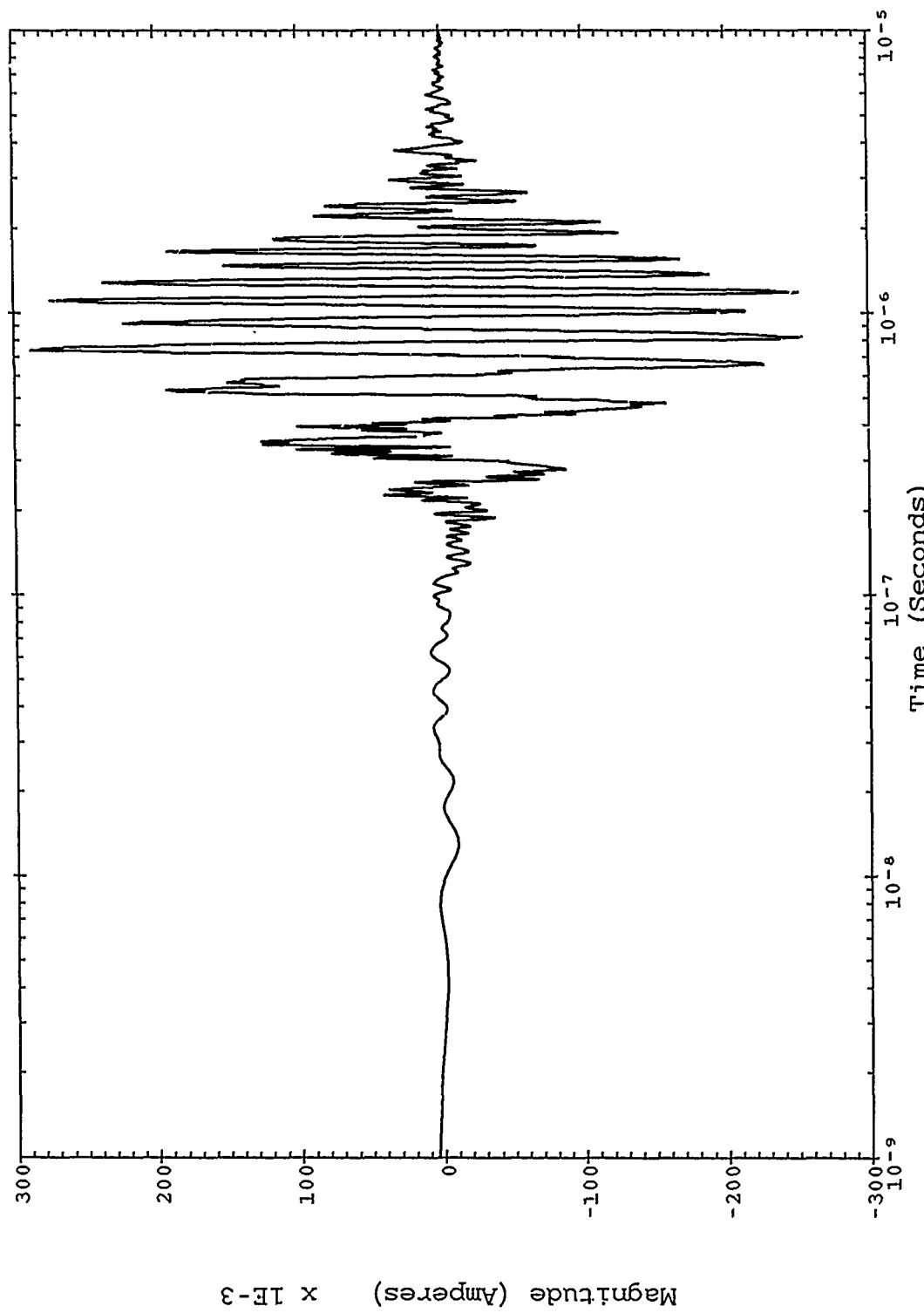


Figure B-152. Corrected TRESTLE data; TP 3543 SN 2265.

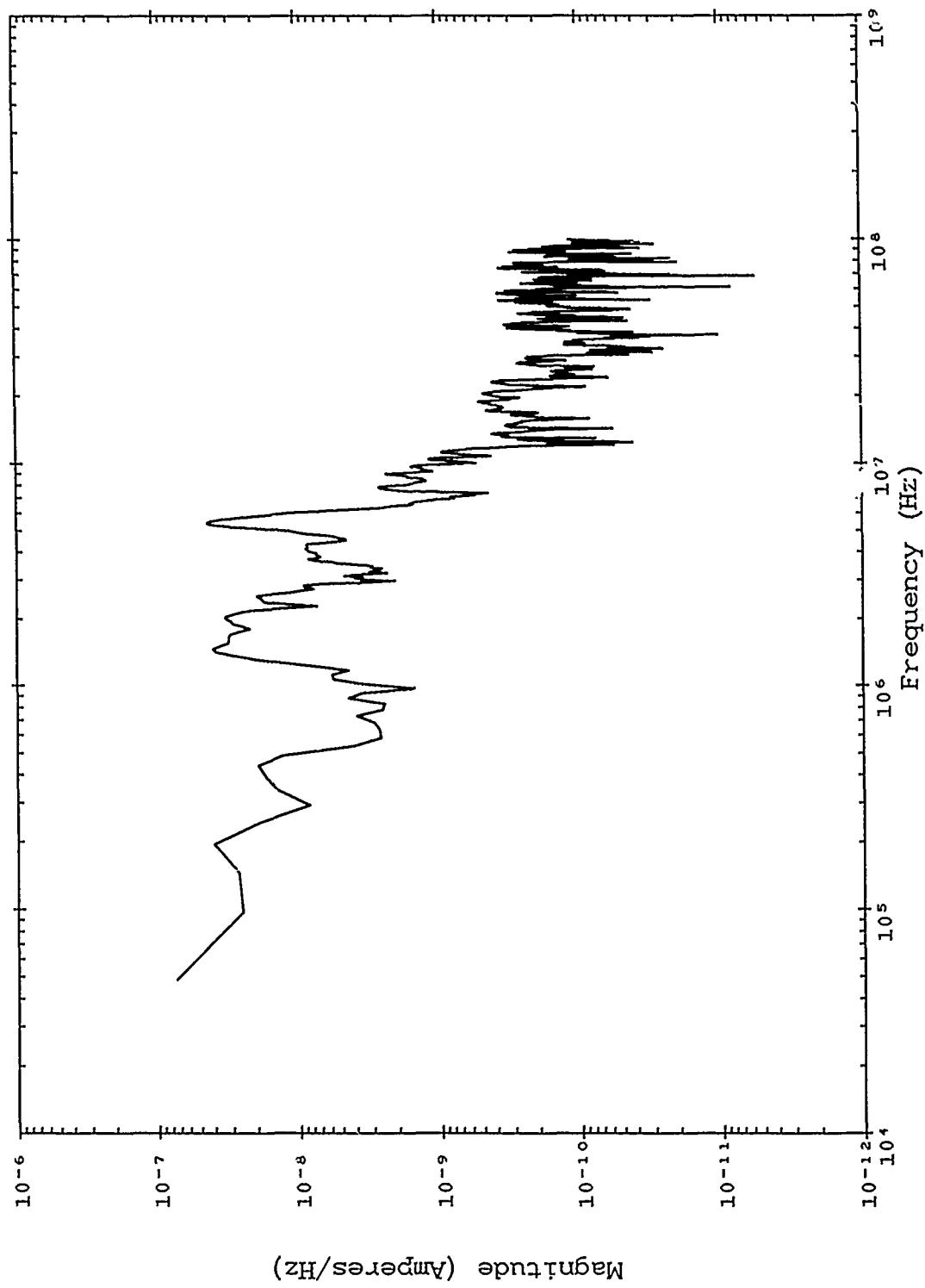


Figure B-153. Severe nearby lightning threat; TP 3543 SN 2265.

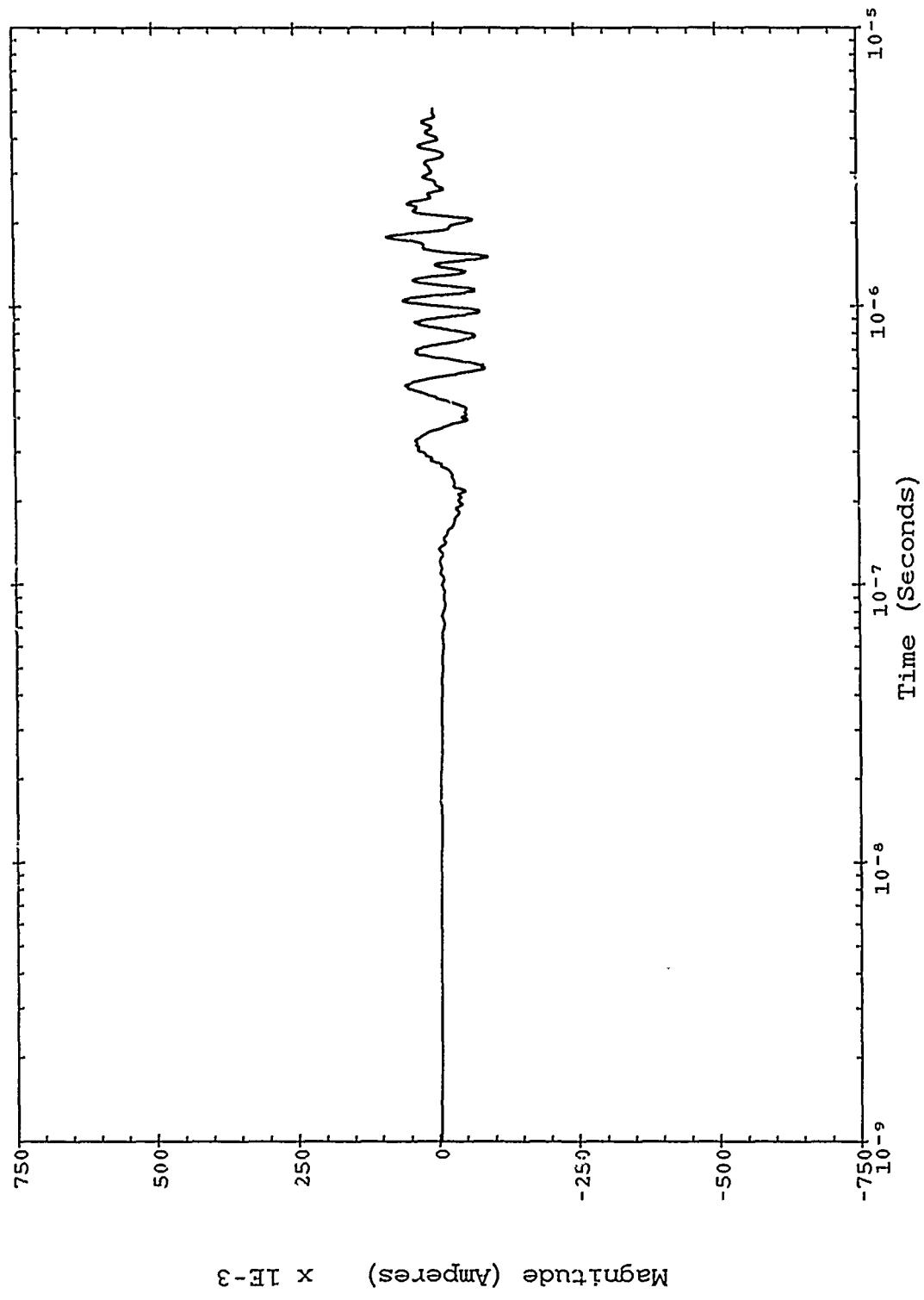


Figure B-154. Severe nearby lightning threat; TP 3543 SN 2265.

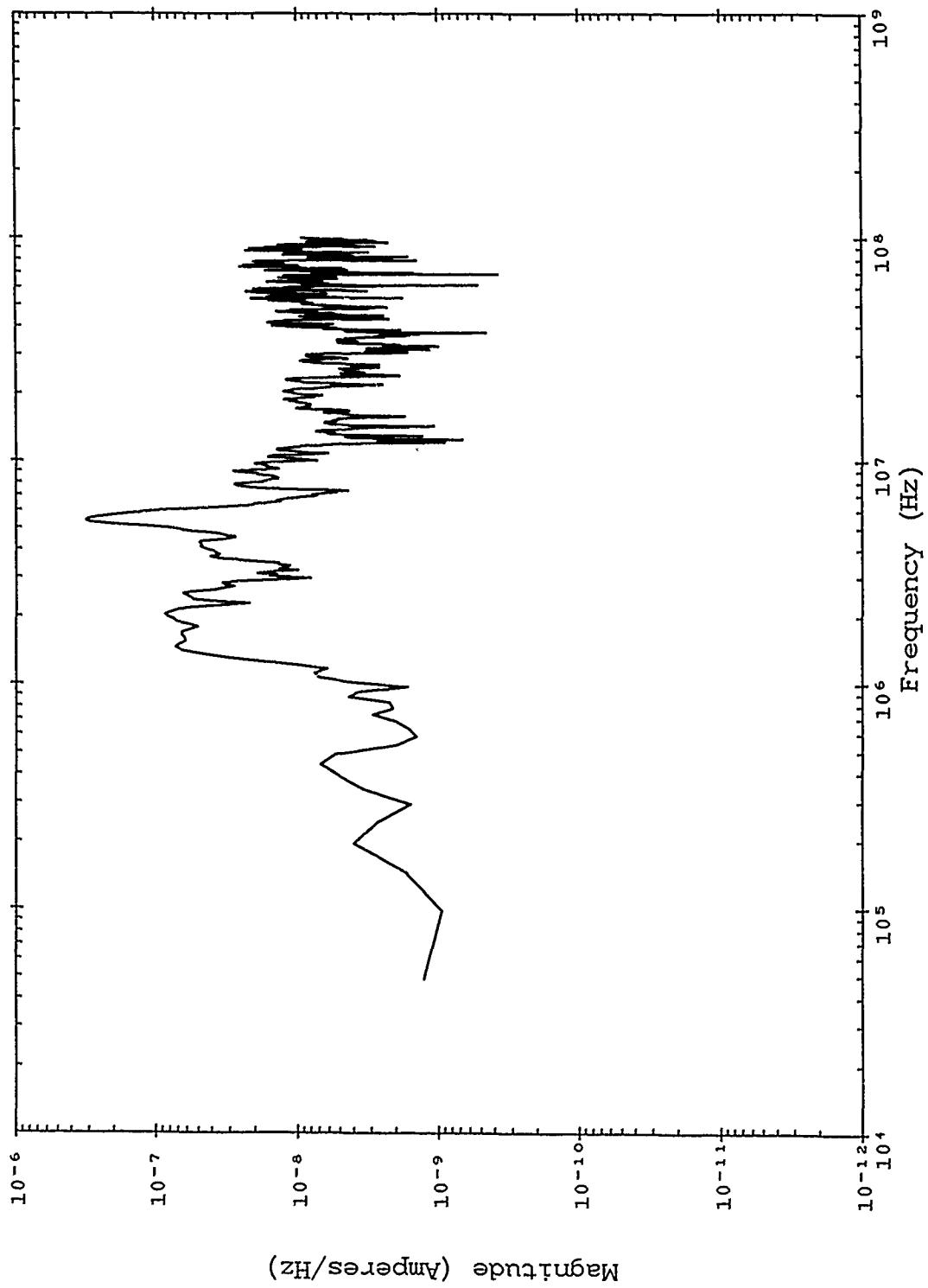


Figure B-155. Double exponential threat; TP 3543 SN 2265.

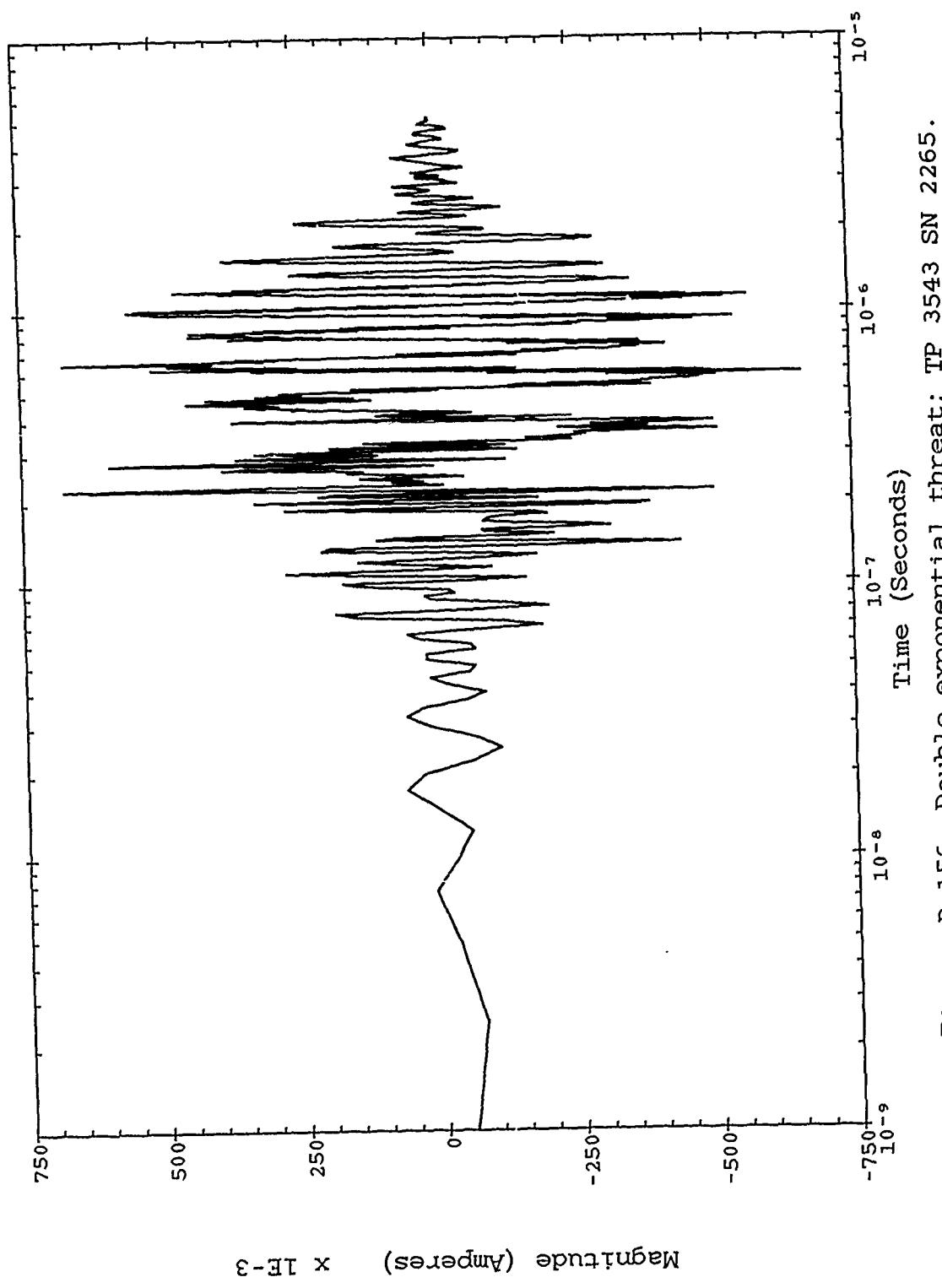


Figure B-156. Double exponential threat; TP 3543 SN 2265.

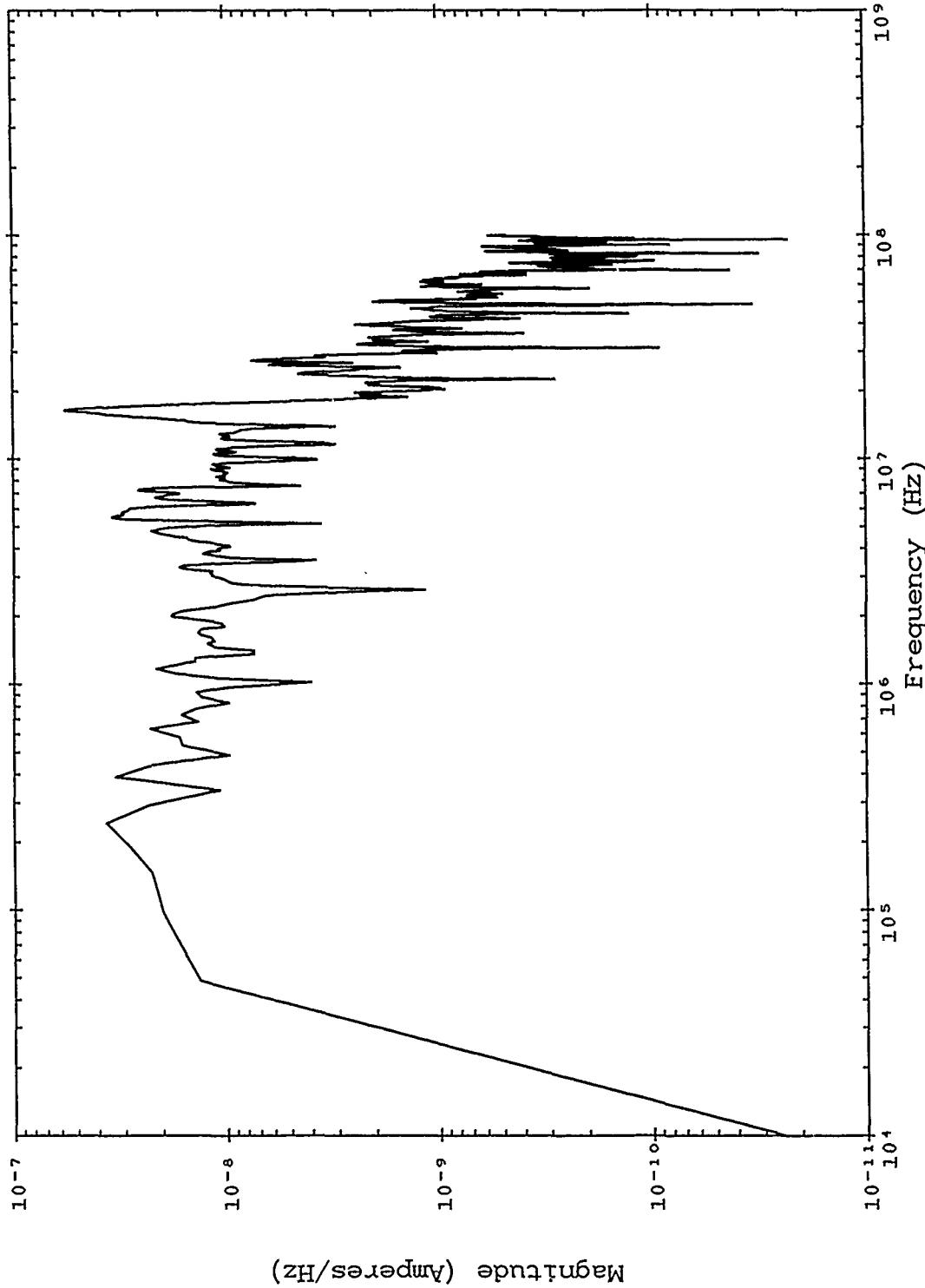


Figure B-157. Corrected TRESTLE data; TP 3615 SN 1675.

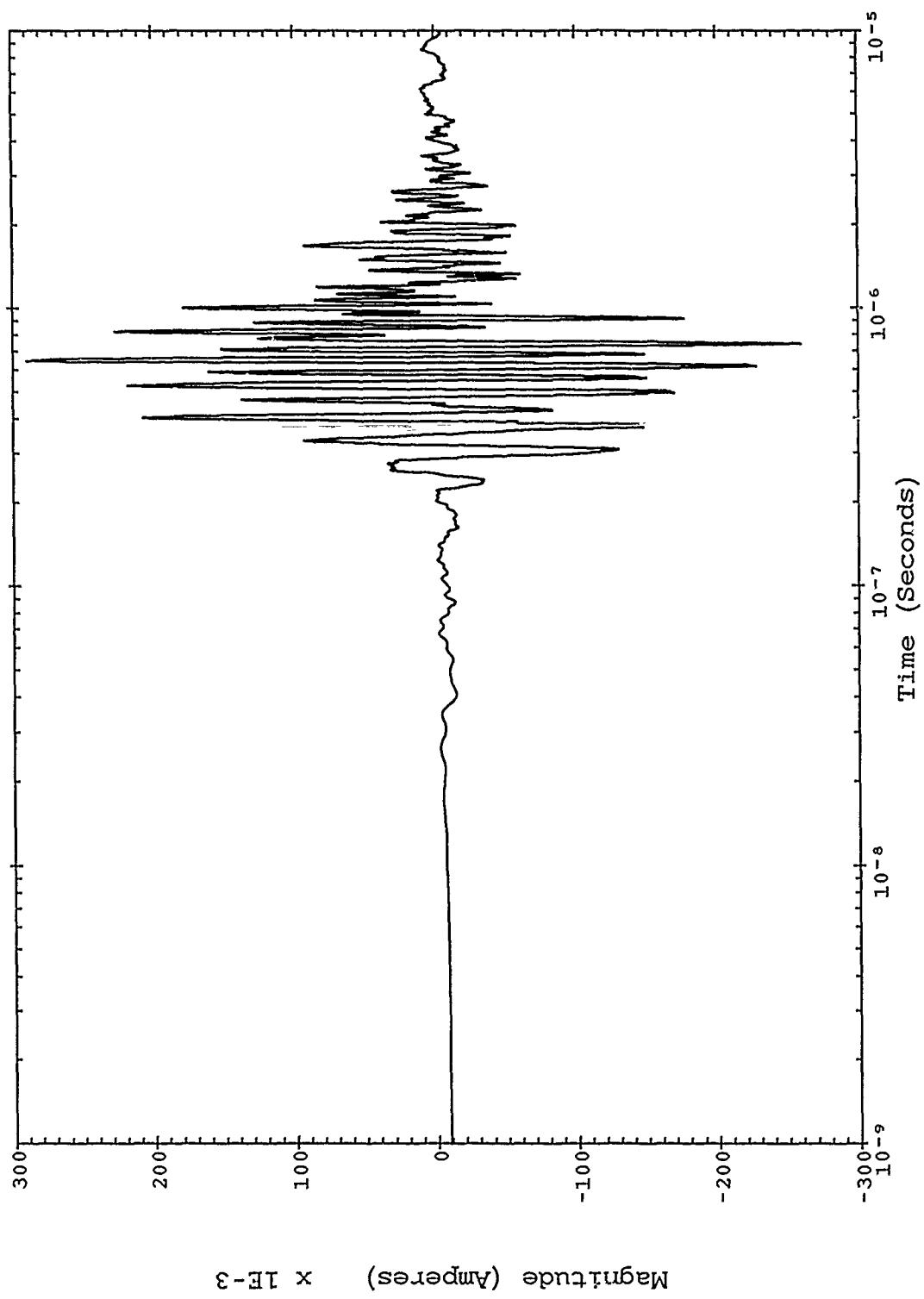


Figure B-158. Corrected TRESTLE data; TP 3615 SN 1675.

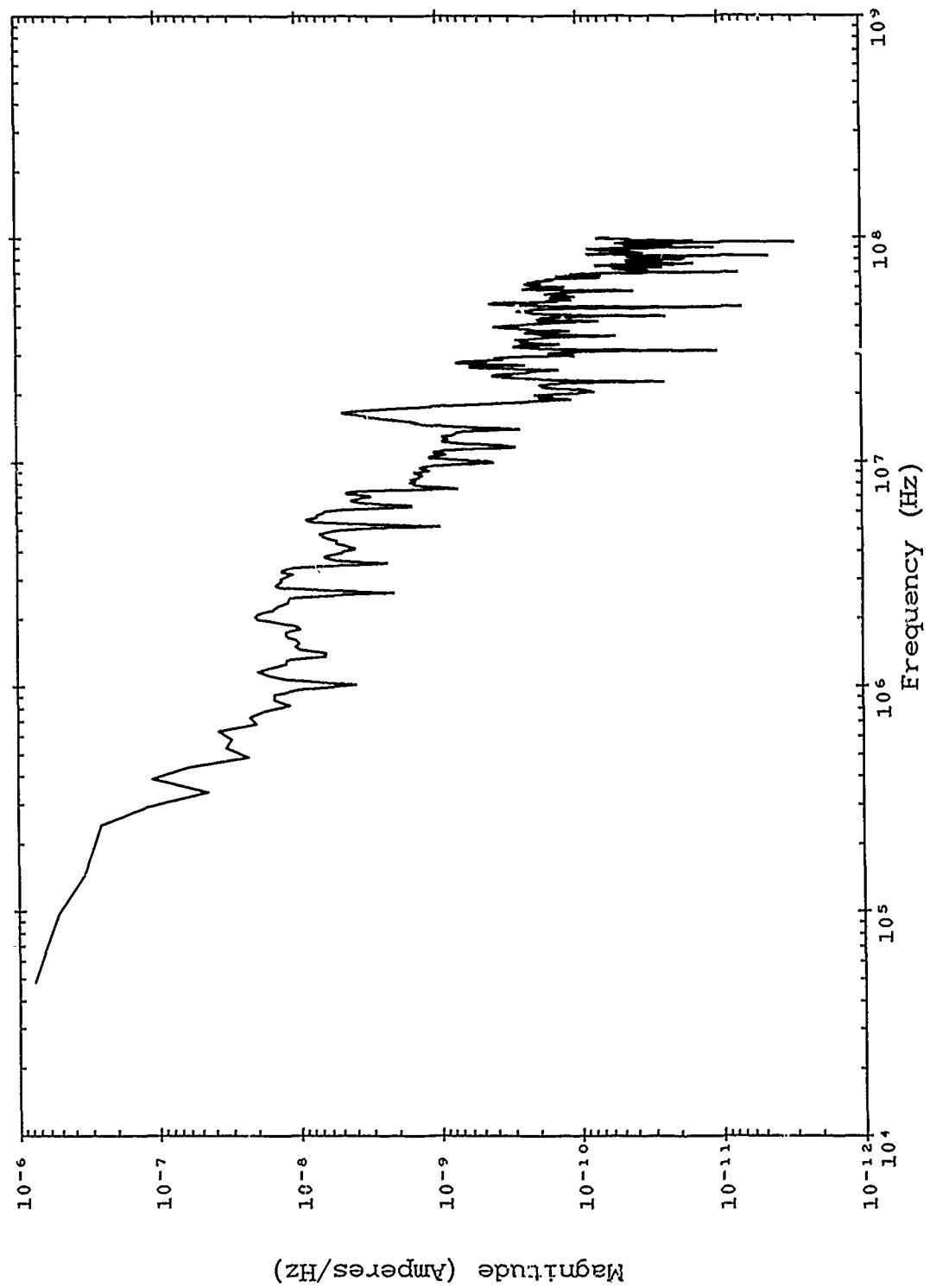


Figure E-159. Severe nearby lightning threat; TP 3615 SN 1675.

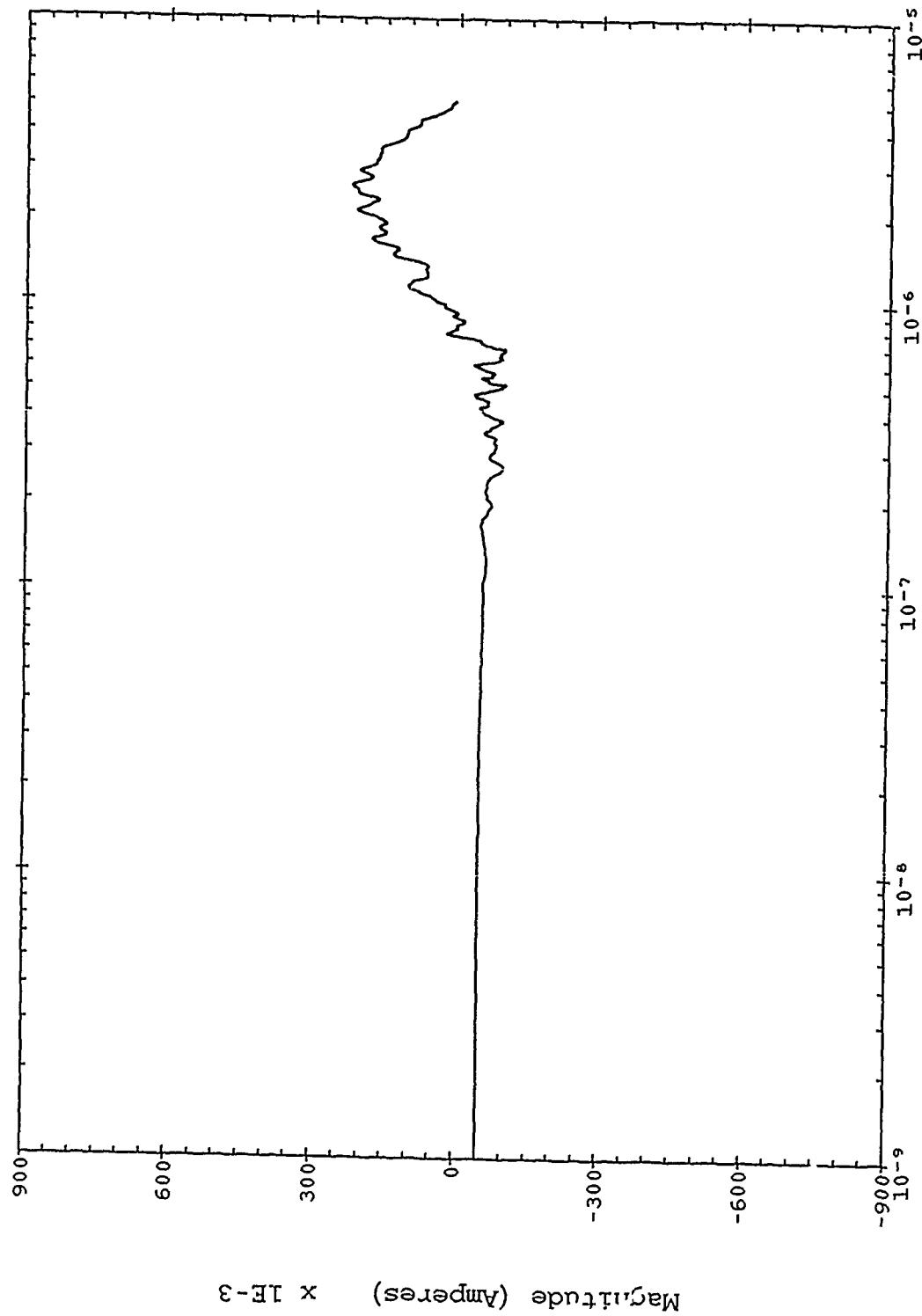


Figure B-160. Severe nearby lightning threat; TP 3615 SN 1675.

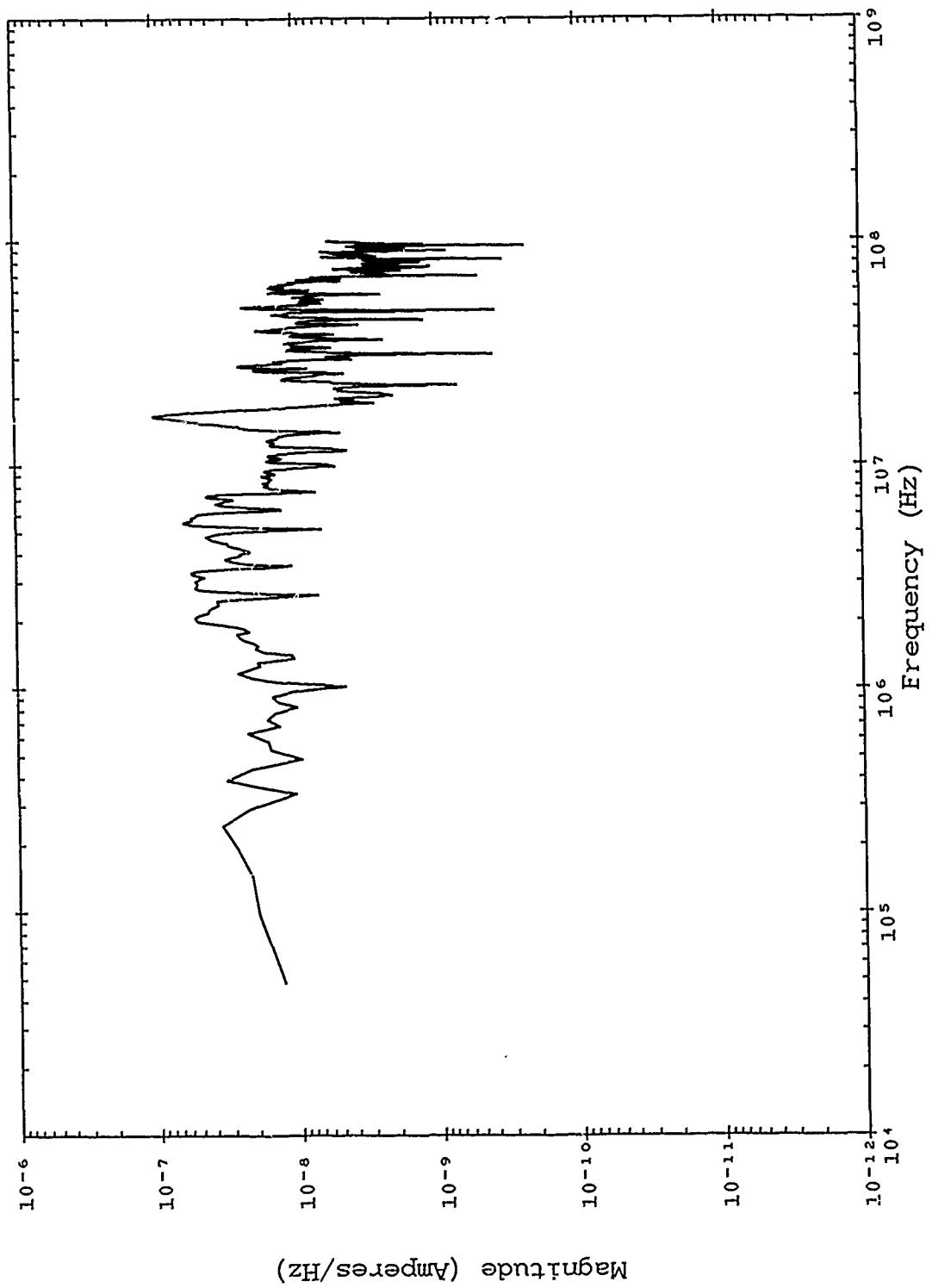


Figure B-161. Double exponential threat; TP 3615 SN 1675.

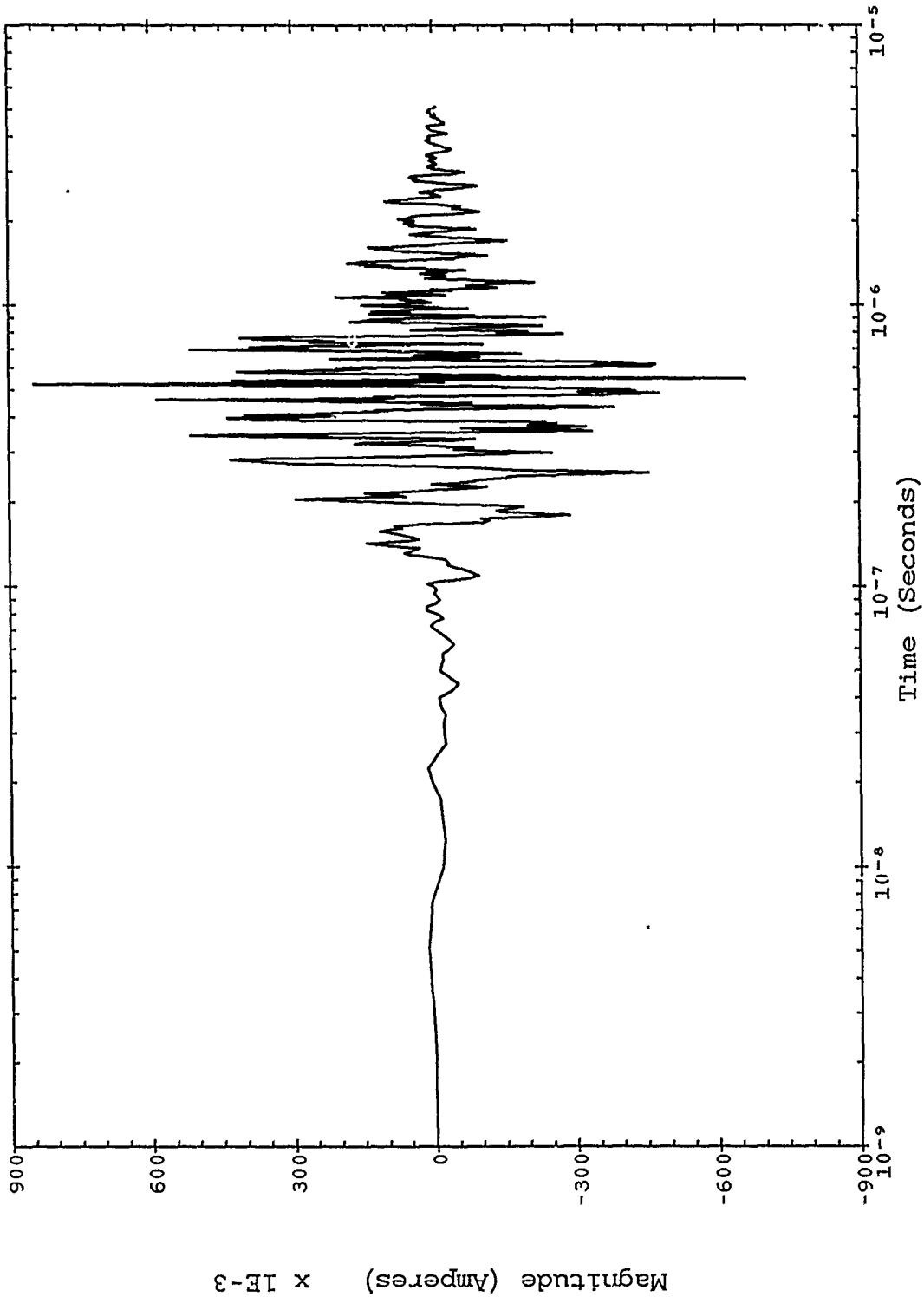


Figure B-162. Double exponential threat; TP 3615 SN 1675.

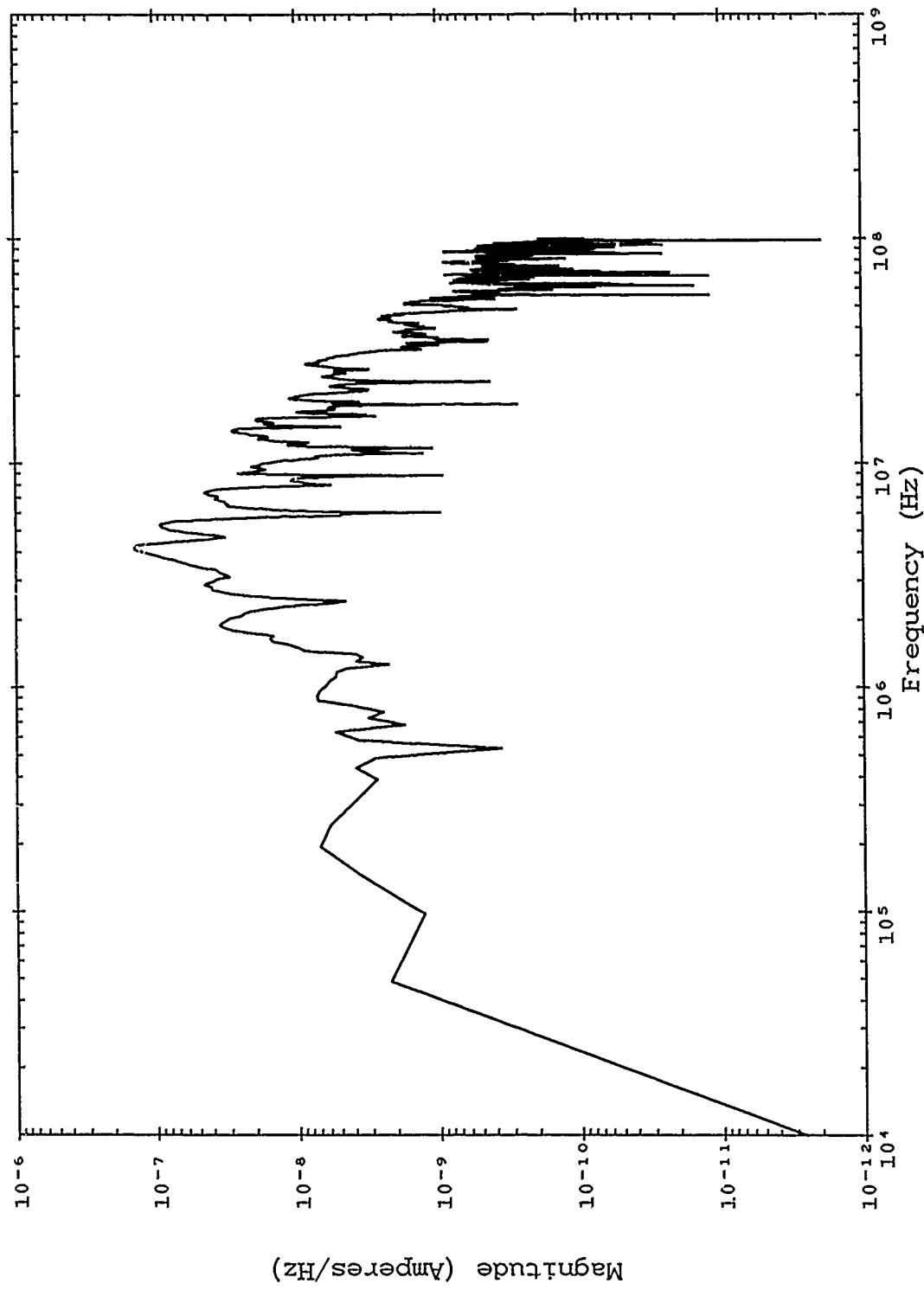


Figure B-163. Corrected TRESTLE data; TP 3626 SN 2531.

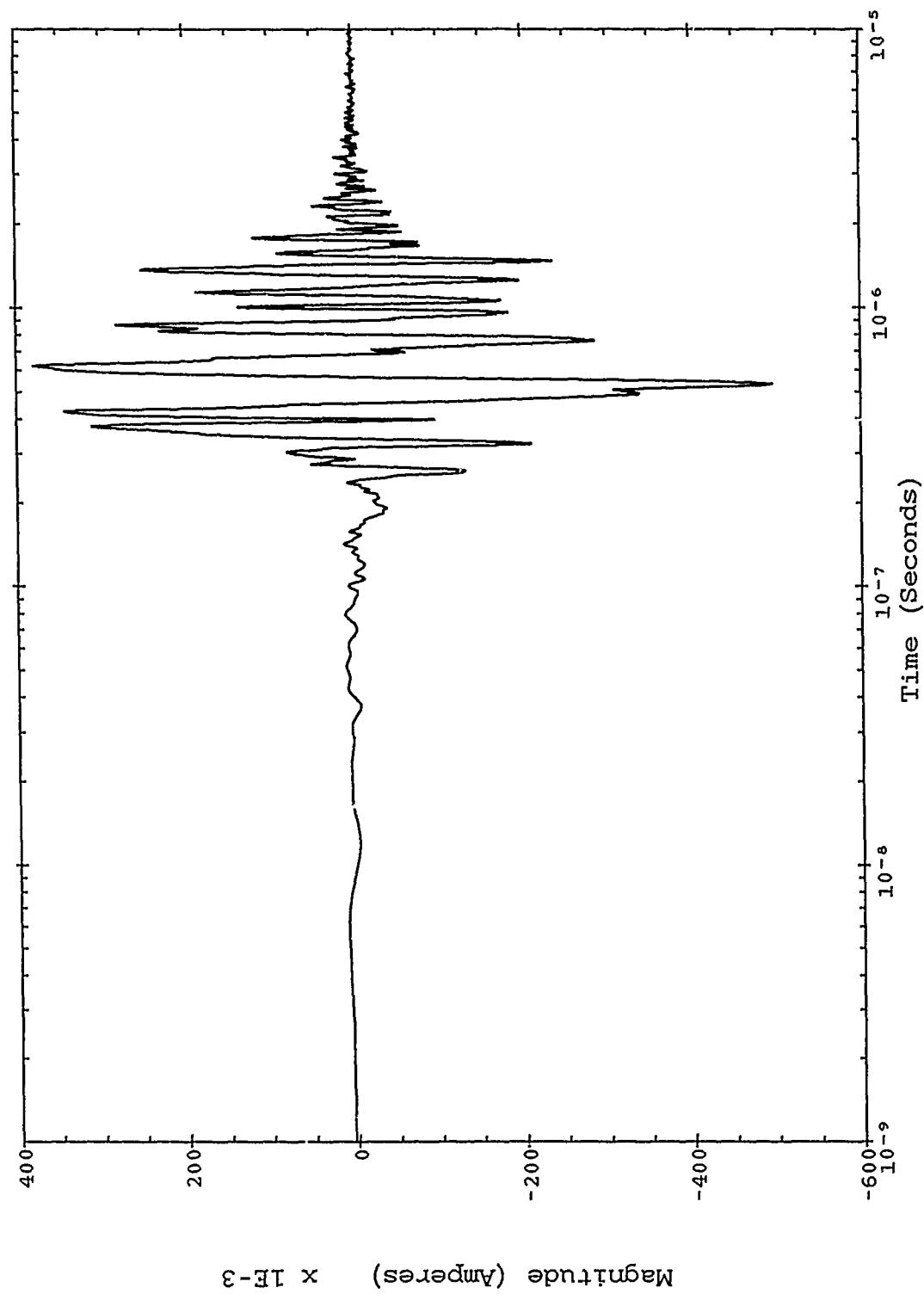


Figure B-164. Corrected TRESTLE data; IP 3626 SN 2531.

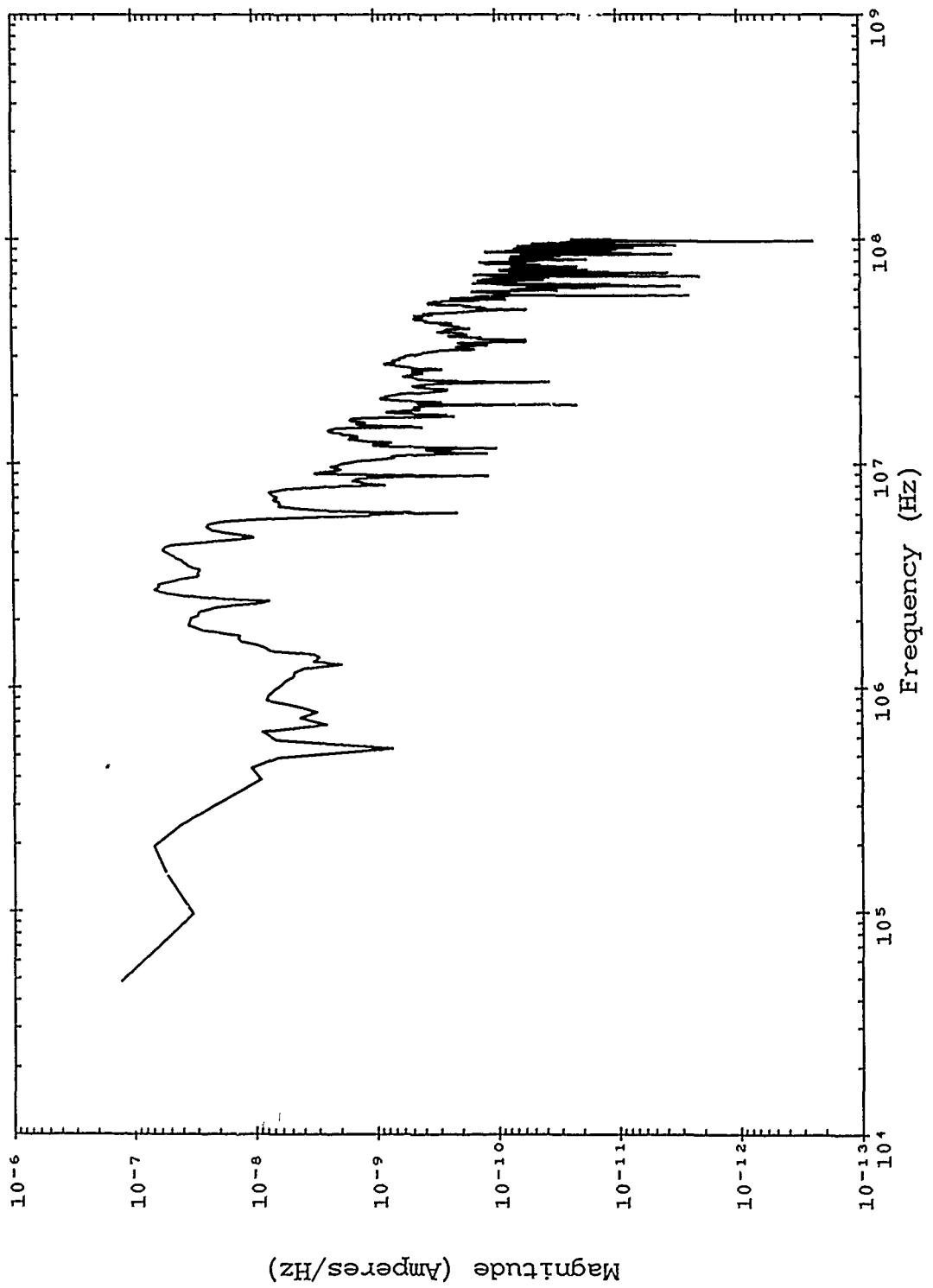


Figure B-165. Severe nearby lightning threat; TP 3626 SN 2531.

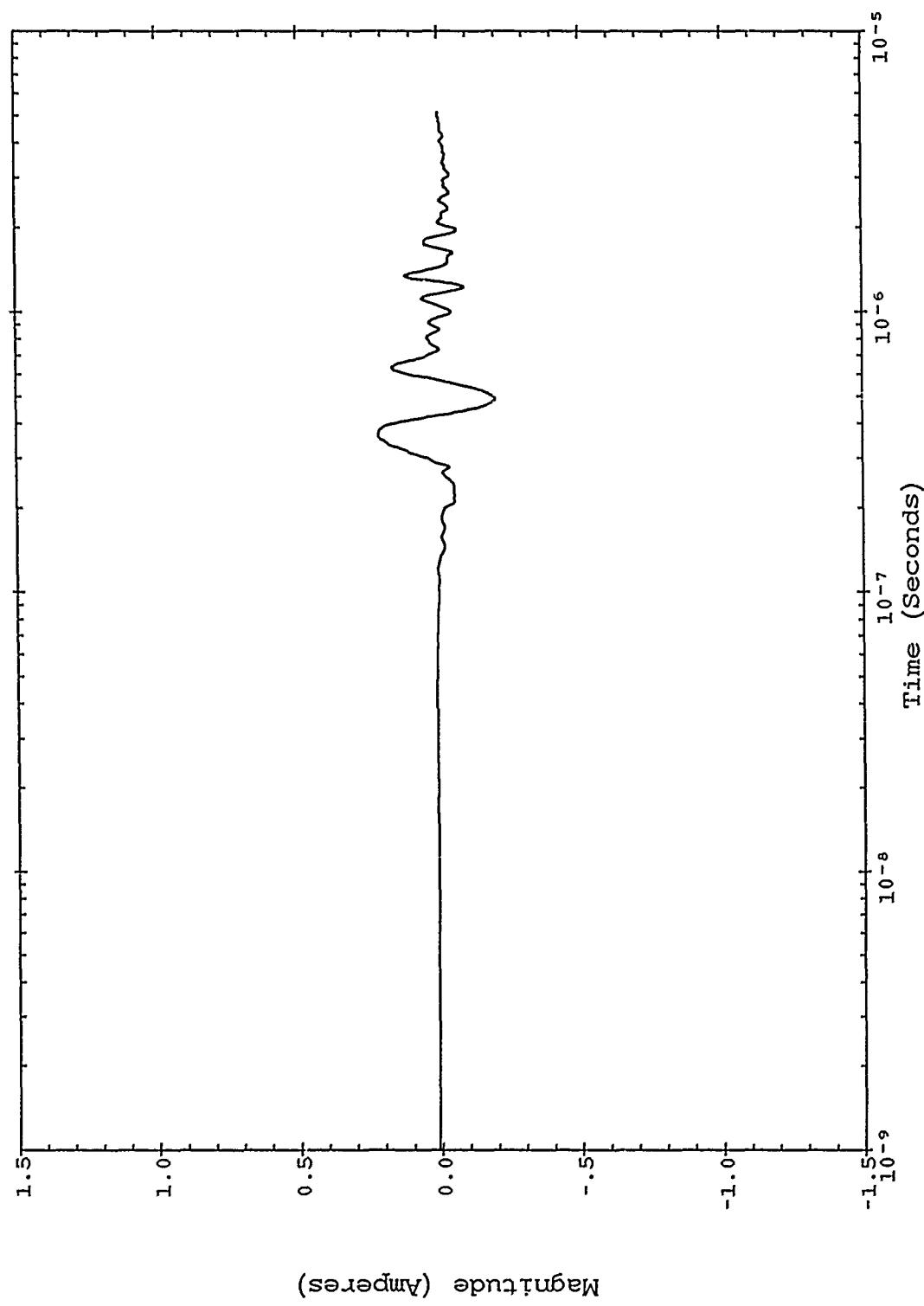


Figure B-166. Severe nearby lightning threat; TP 3626 SN 2531.

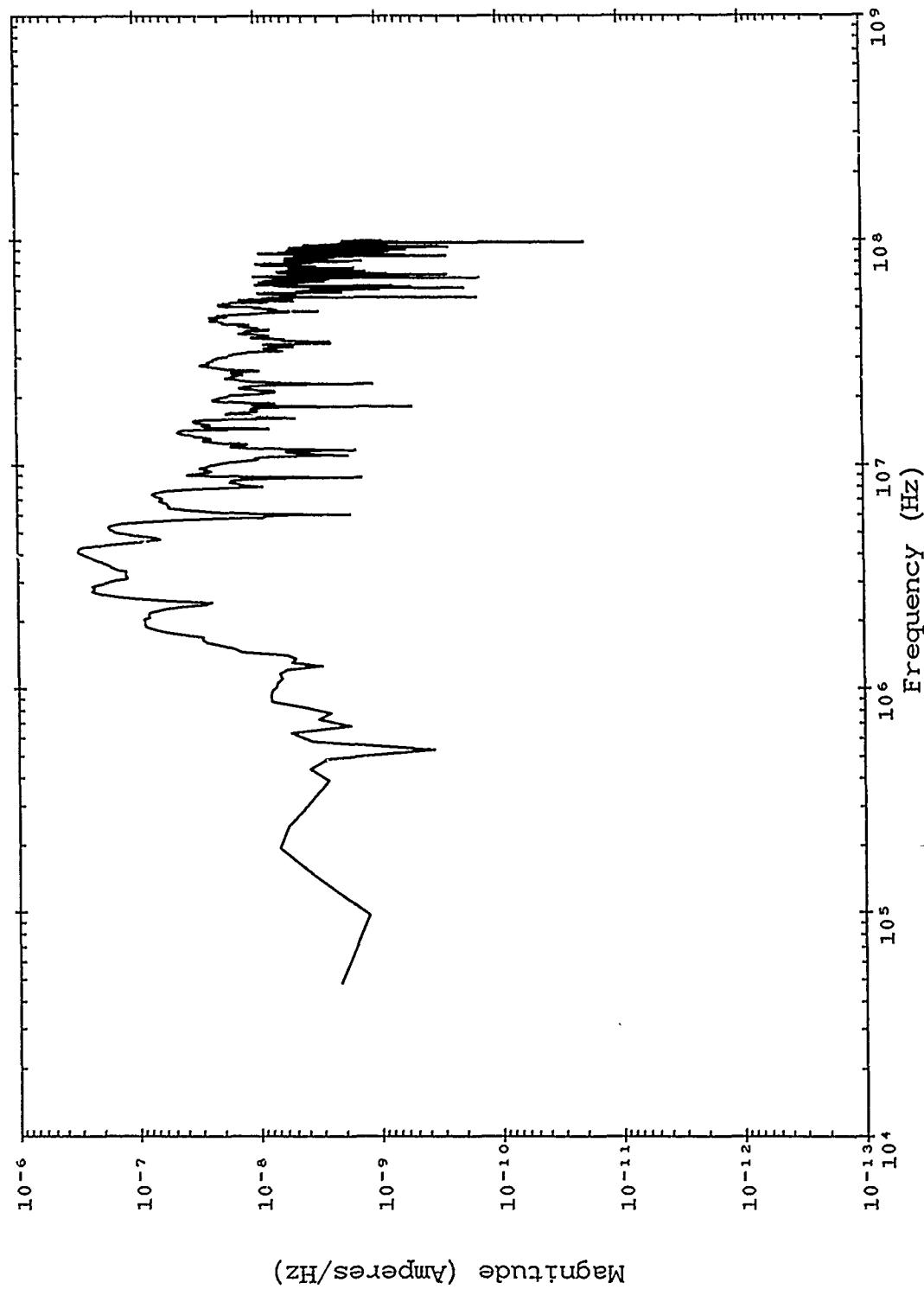


Figure B-167. Double exponential threat; TP 3626 SN 2531.

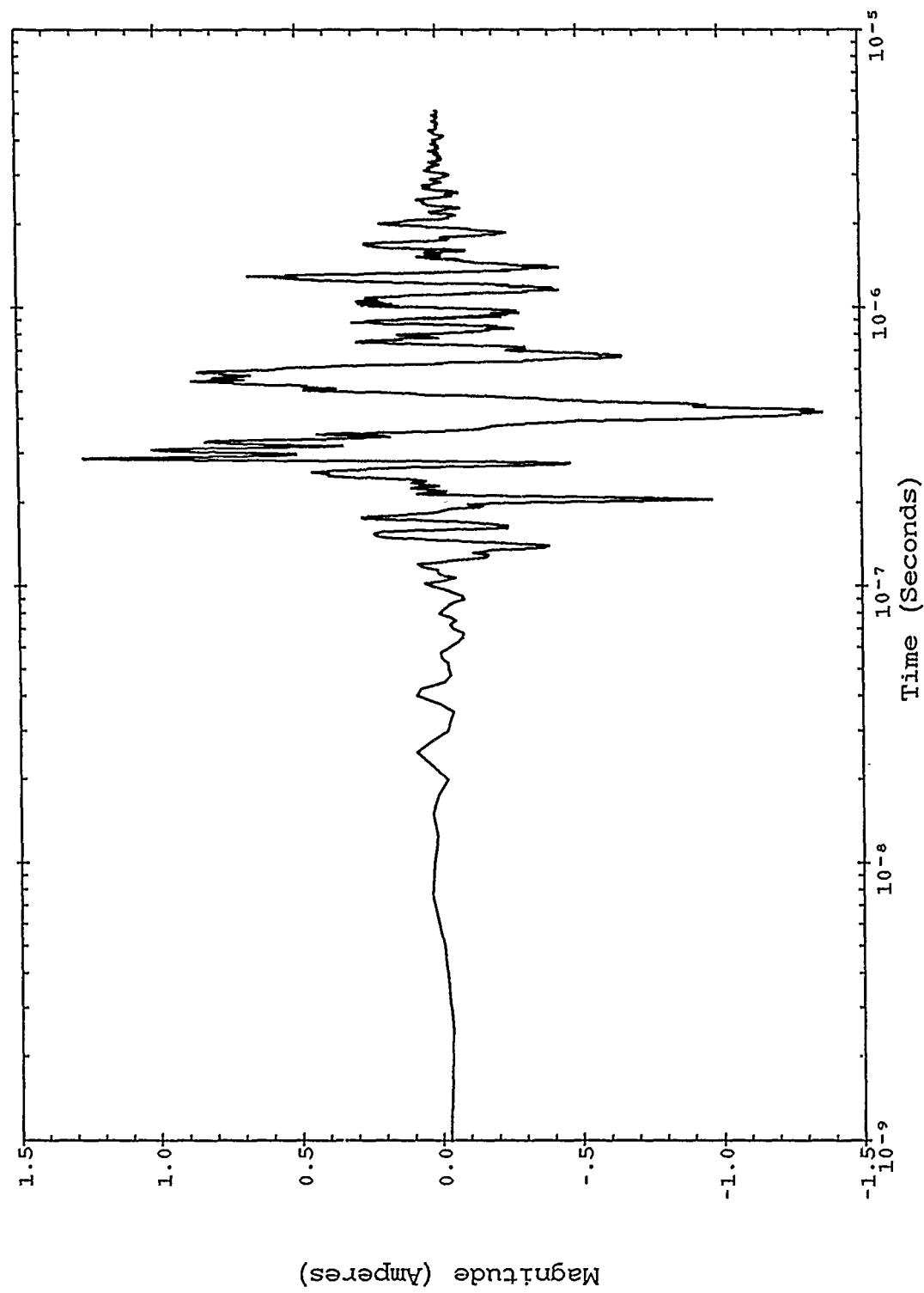


Figure B-168. Double exponential threat; TP 3626 SN 2531.

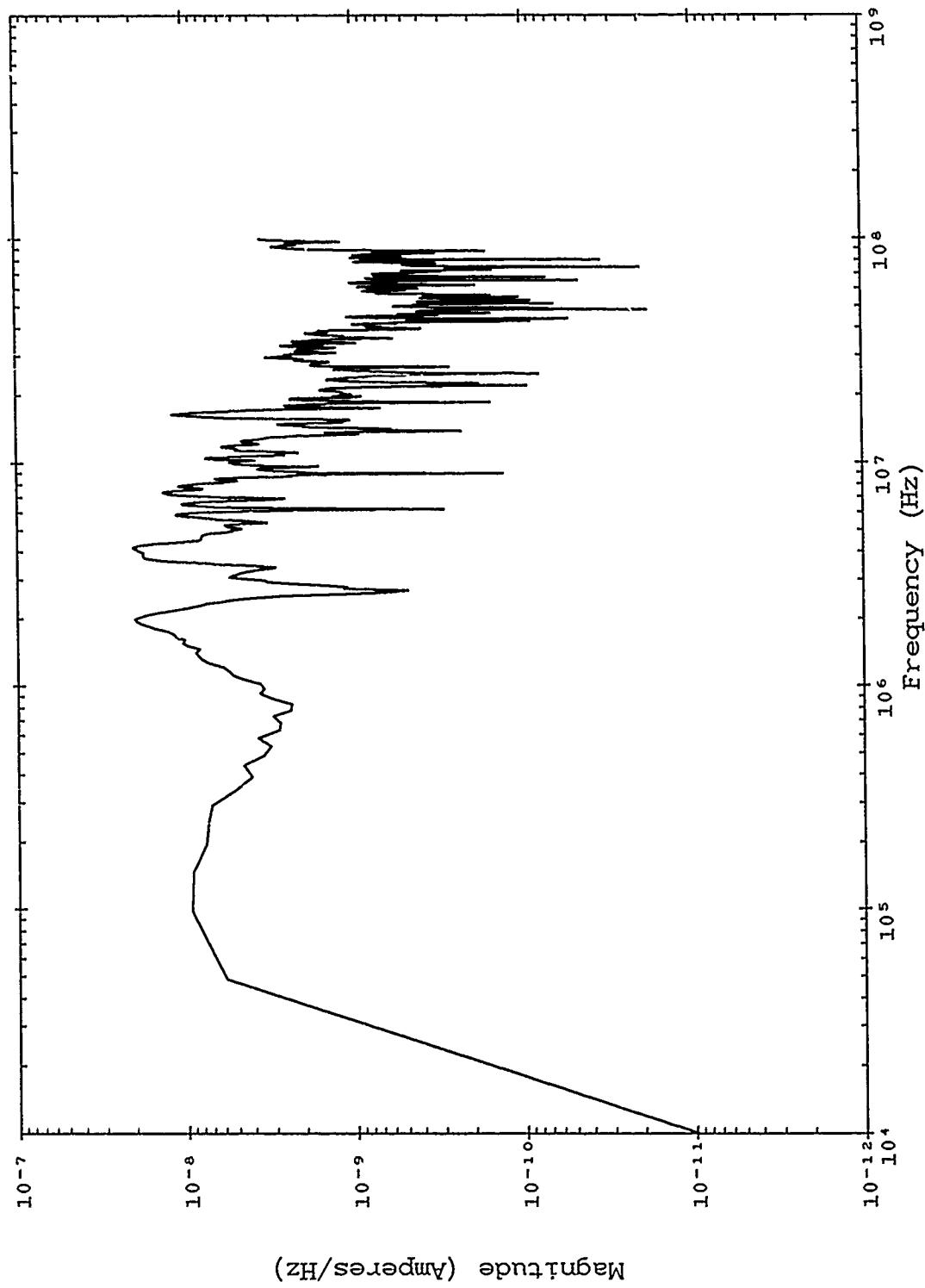


Figure B-169. Corrected TRESTLE data; TP 3795 SN 2281.

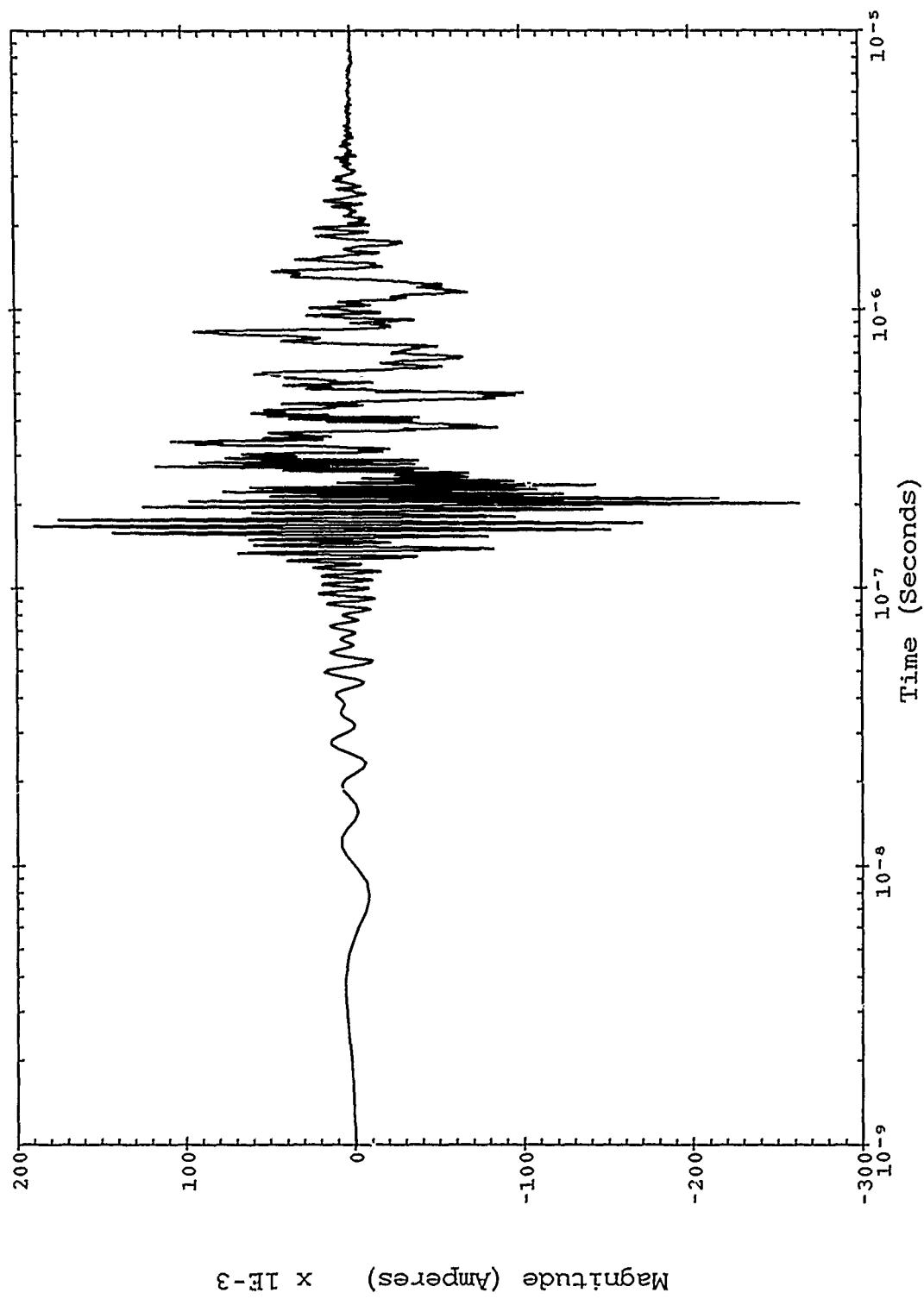


Figure B-170. Corrected TRESTLE data; TP 3795 SN 2281.

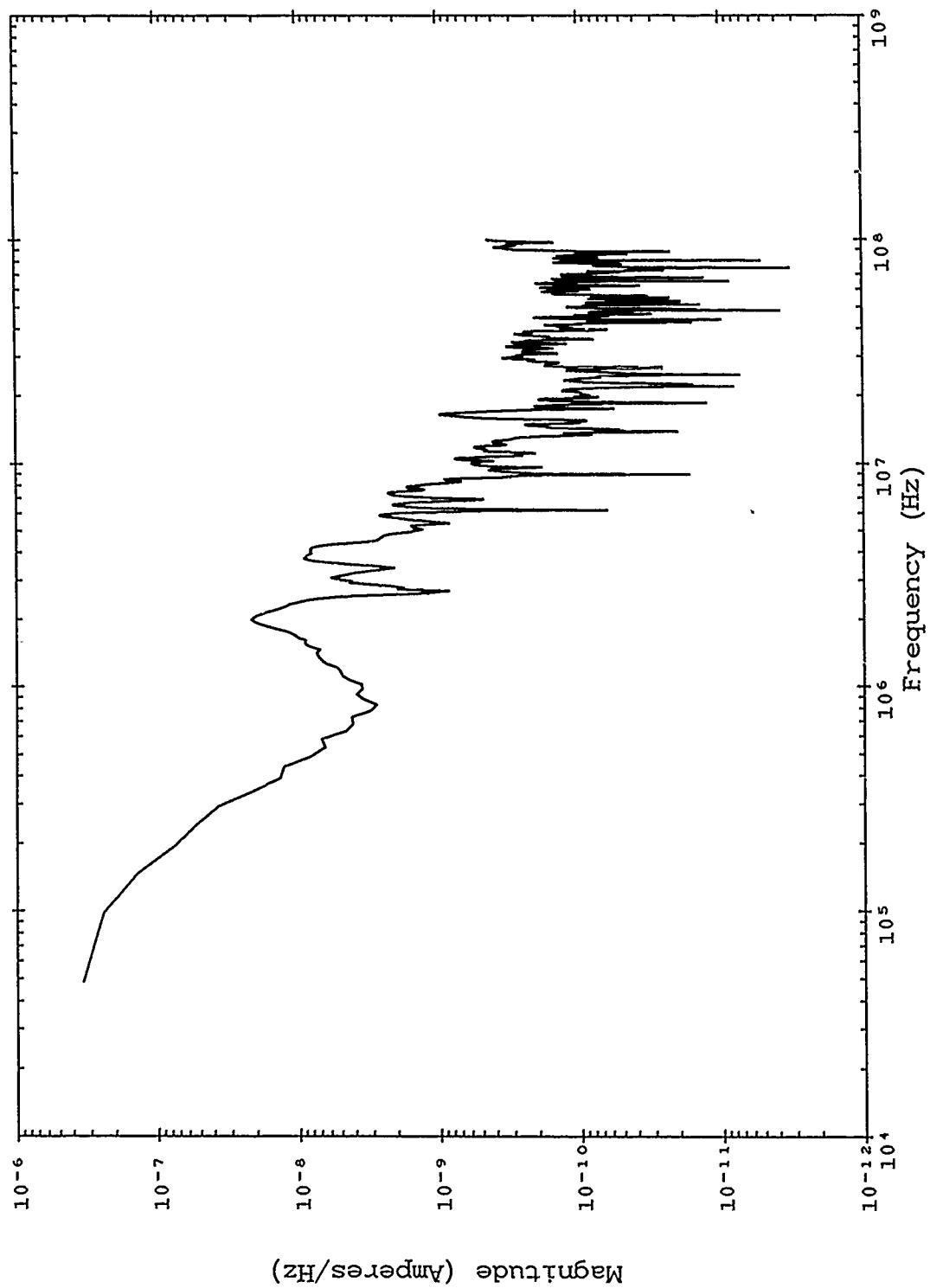


Figure B-171. Severe nearby lightning threat; TP 3795 SN 2281.

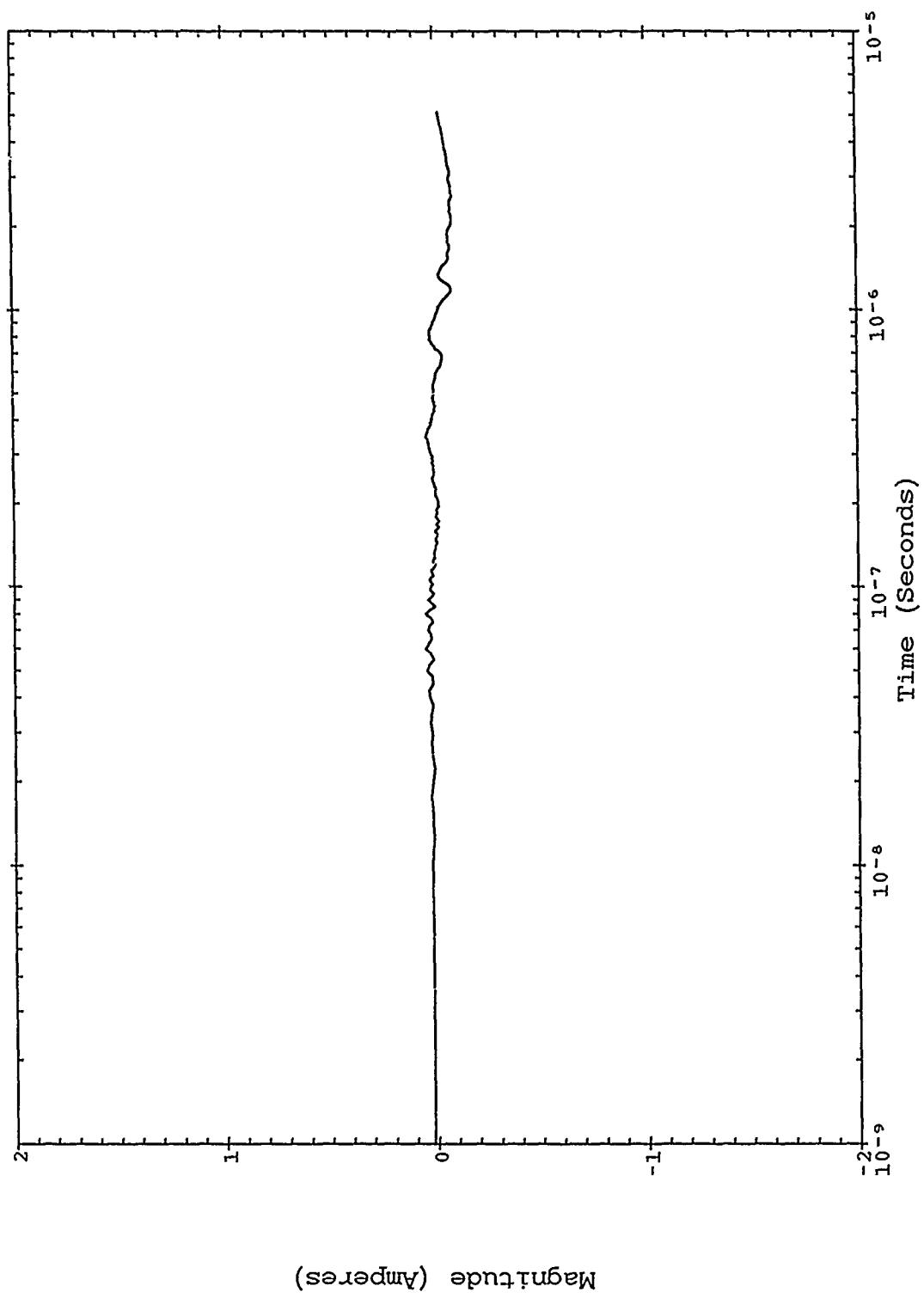


Figure B-172. Severe nearby lightning threat; TP 3795 SN 2281.

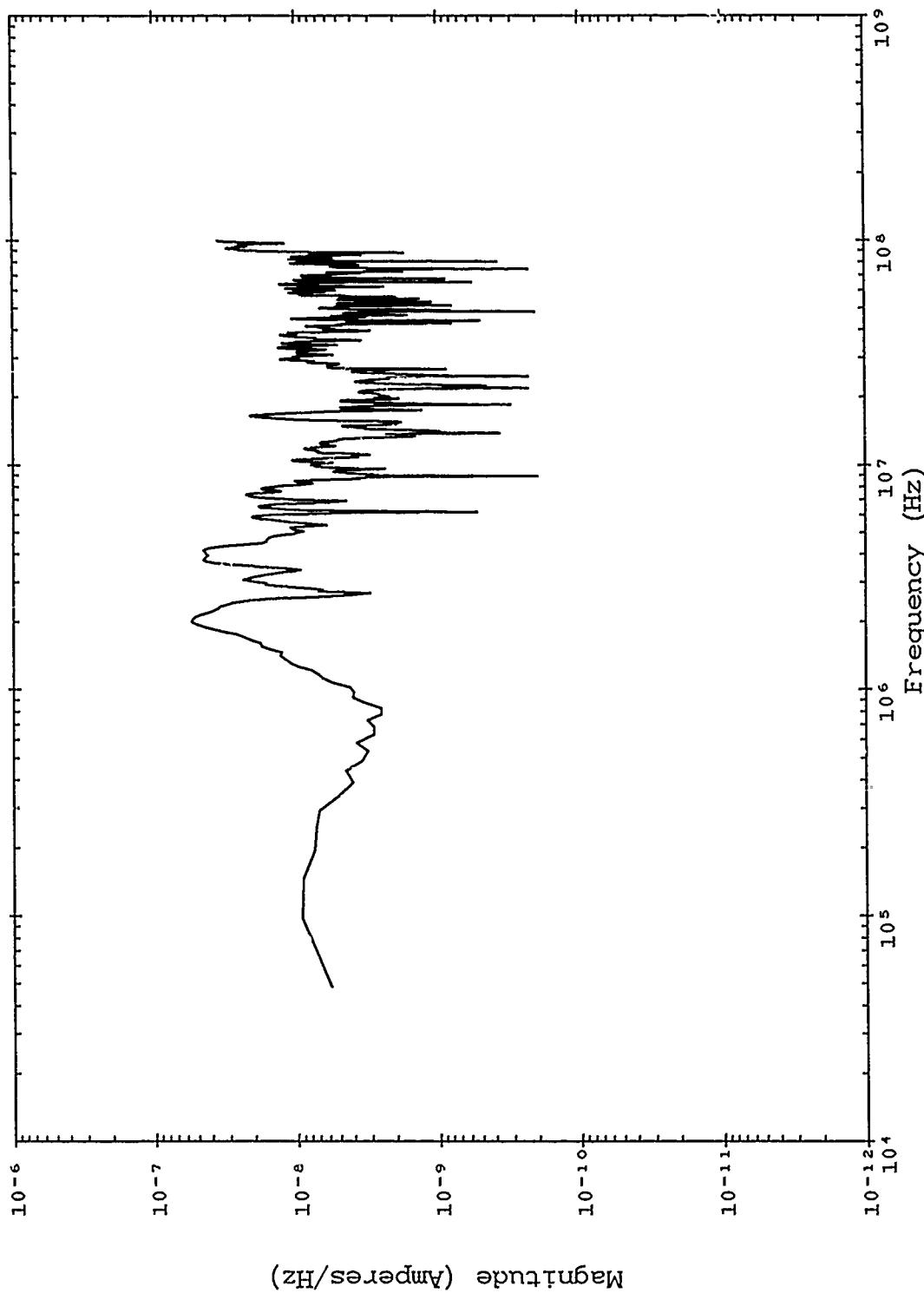


Figure B-173. Double exponential threat; TP 3795 SN 2281.

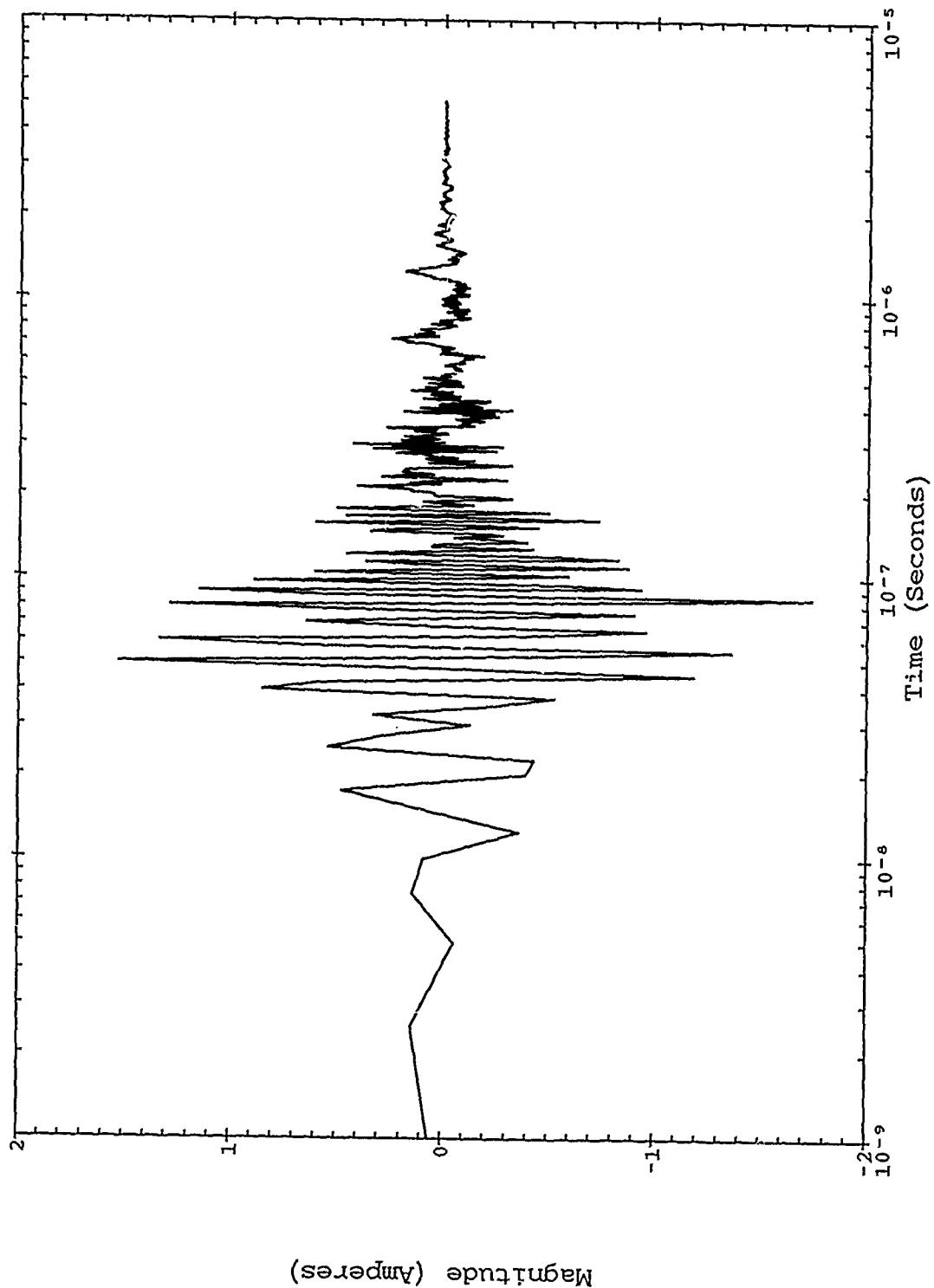


Figure B-174. Double exponential threat; TP 3795 SN 2281.

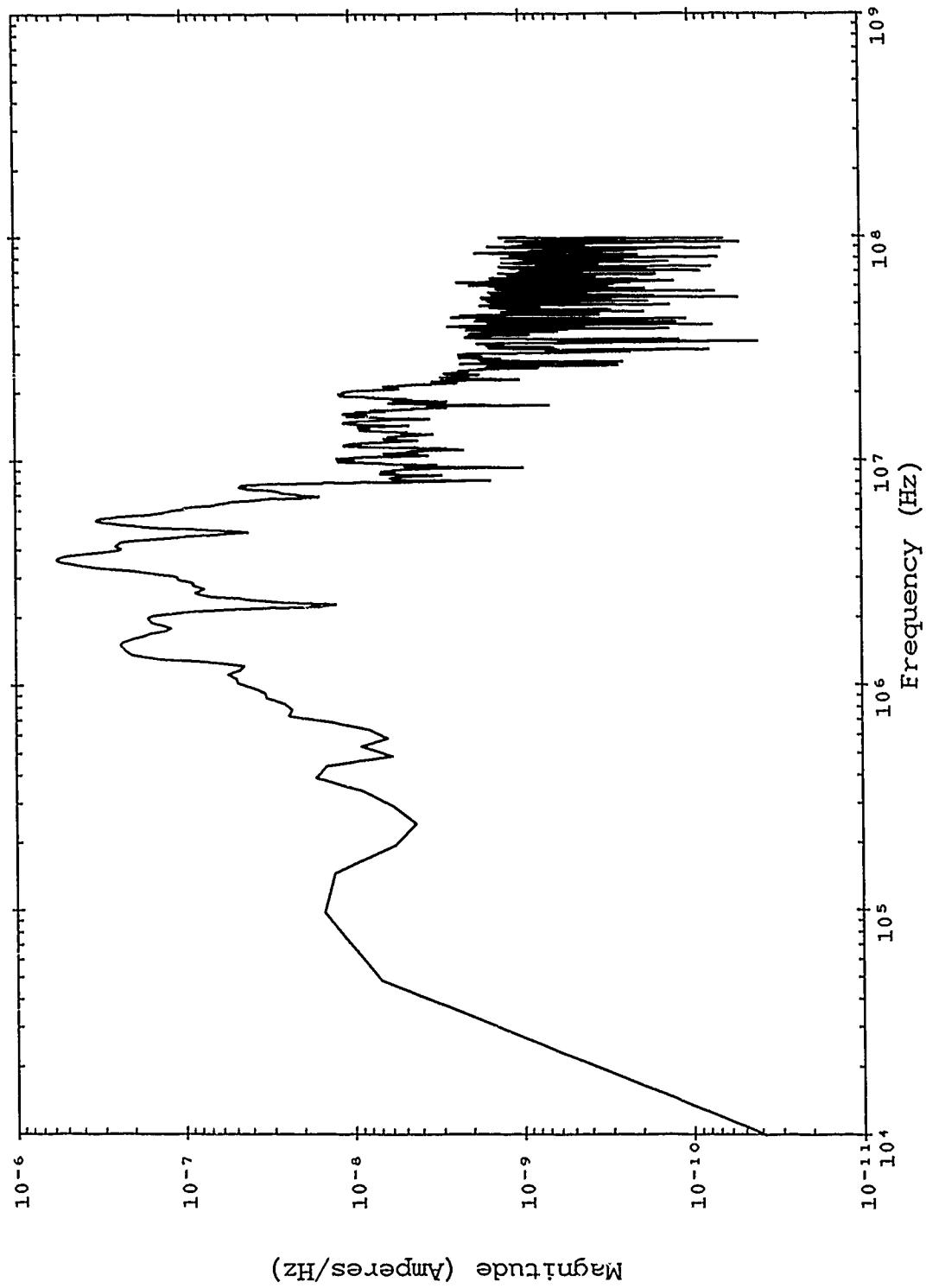


Figure B-175. Corrected TRESTLE data; TP 3884 SN 2255.

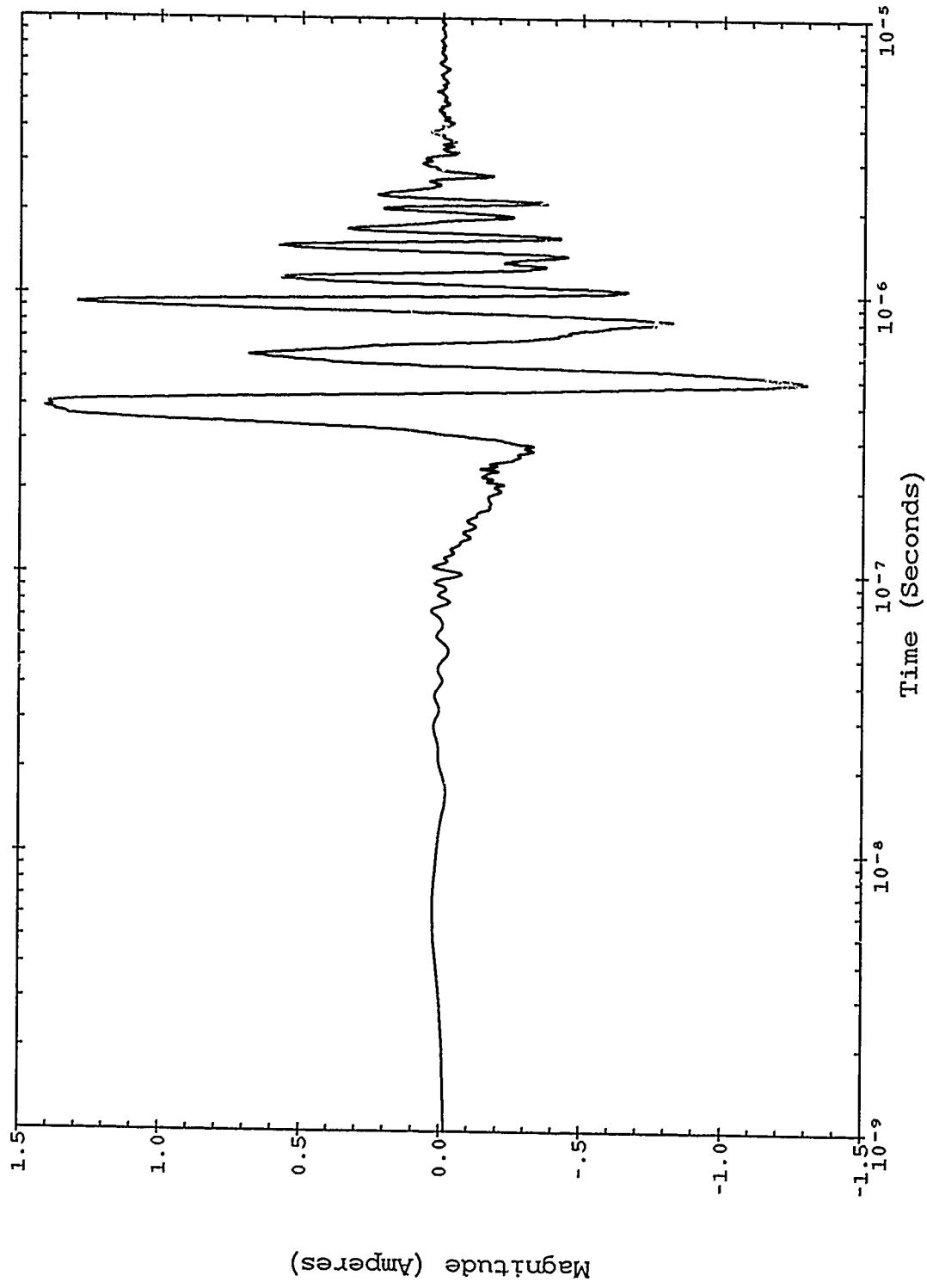


Figure B-176. Corrected TRESTLE data; TP 3884 SN 2255.

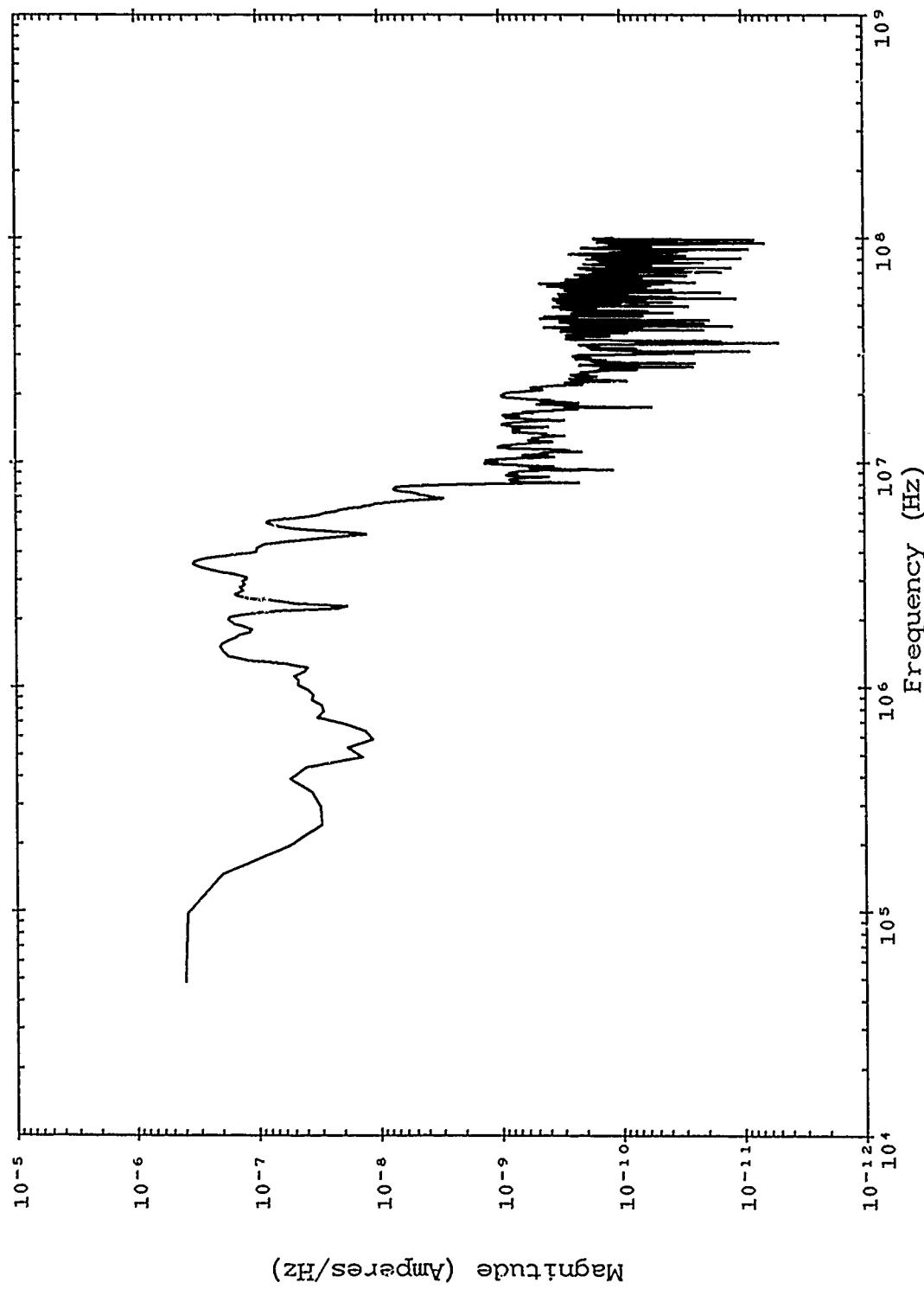


Figure B-177. Severe nearby lightning threat; TP 3884 SN 2255.

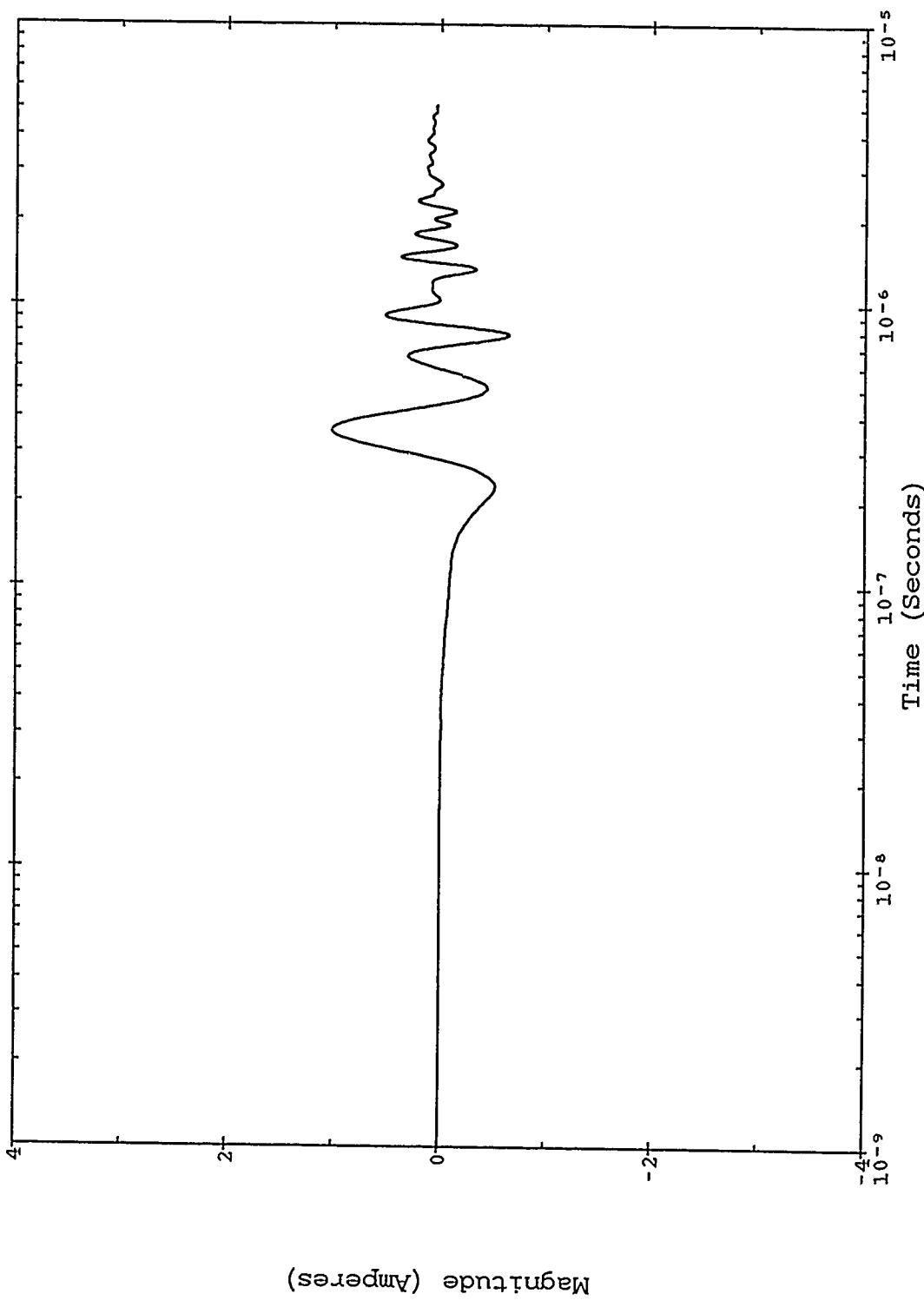


Figure B-178. Severe nearby lightning threat; TP 3884 SN 2255.

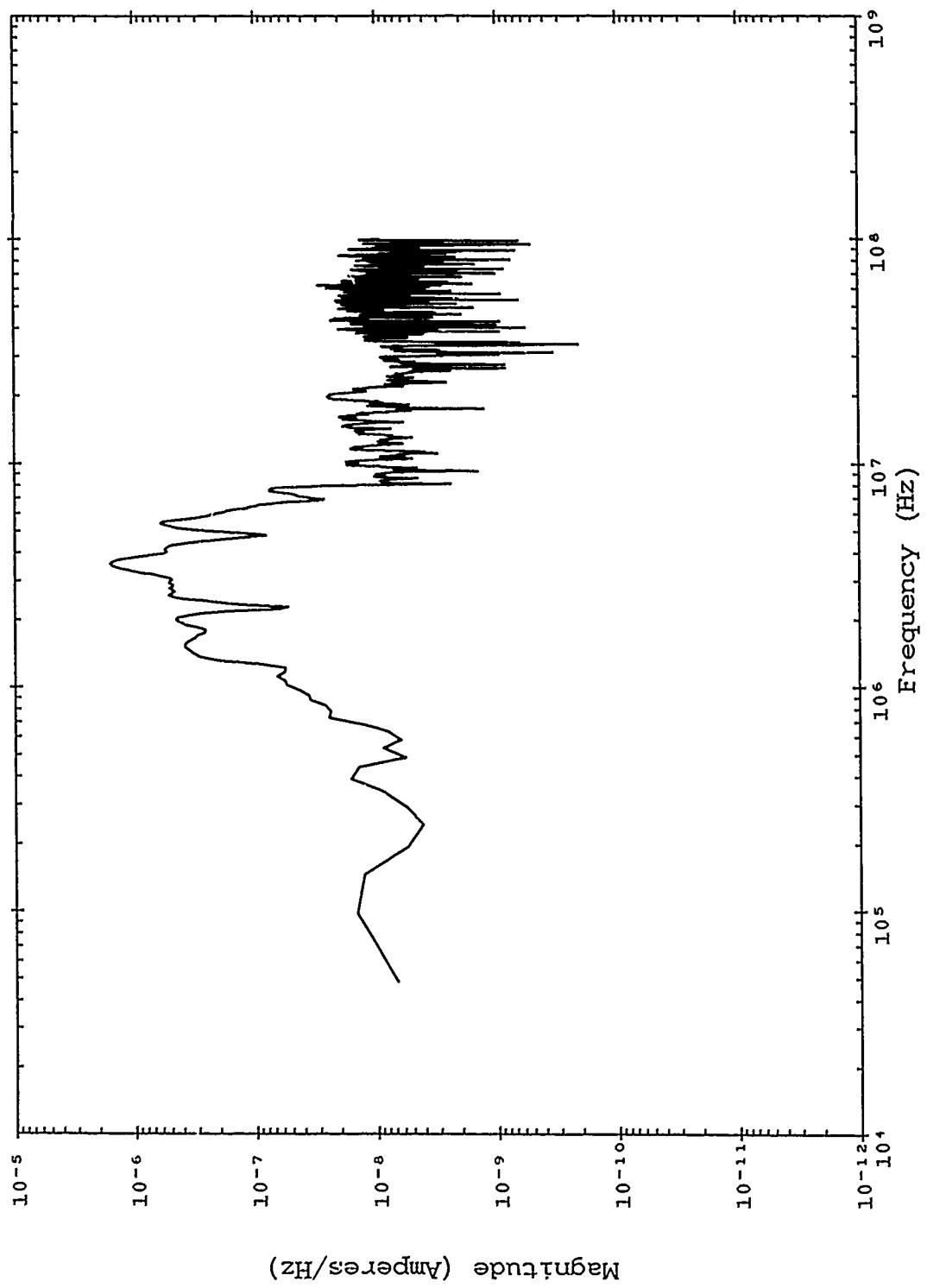


Figure B-179. Double exponential threat; TP 3884 SN 2255.

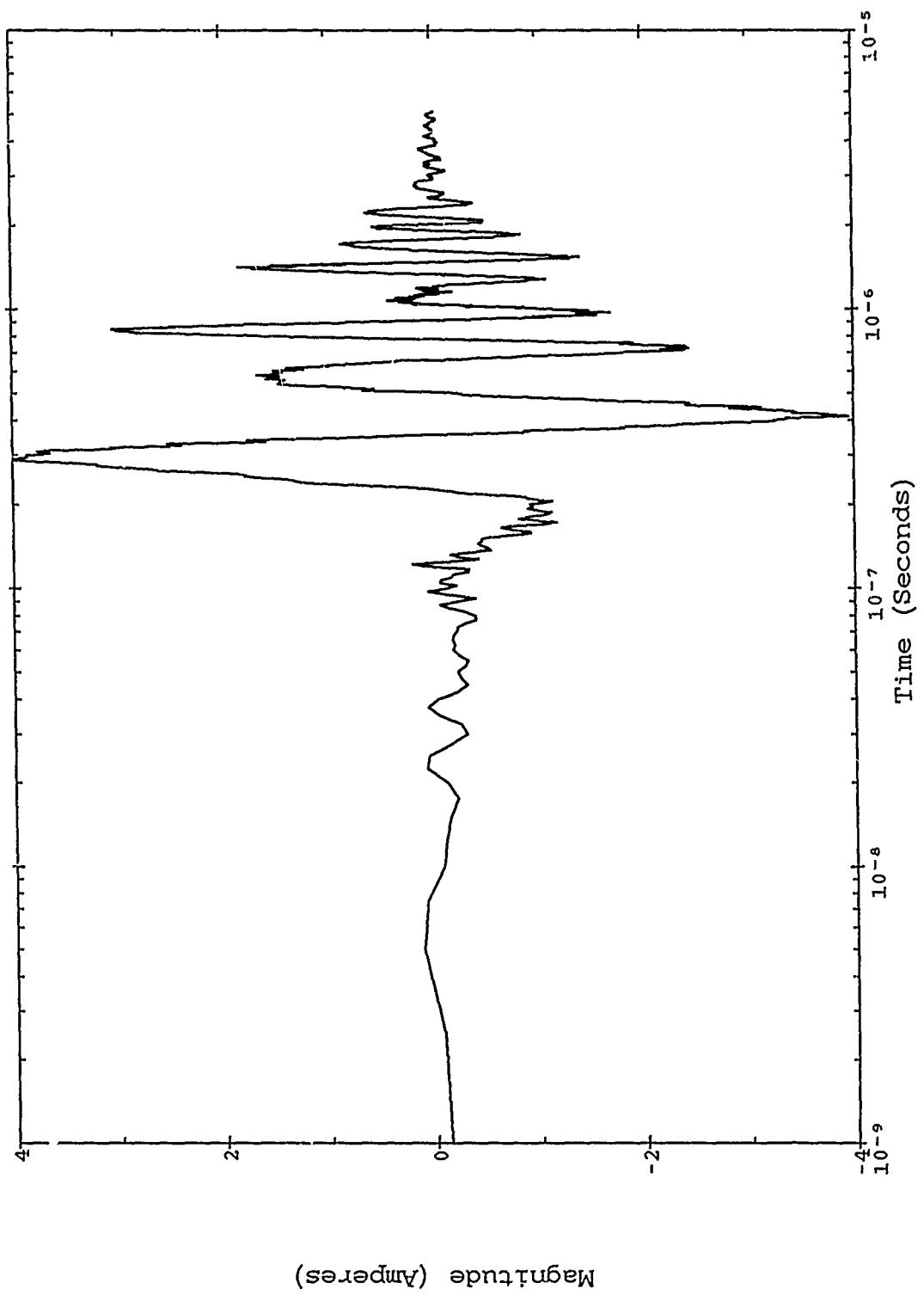


Figure B-180. Double exponential threat; IP 3884 SN 2255.

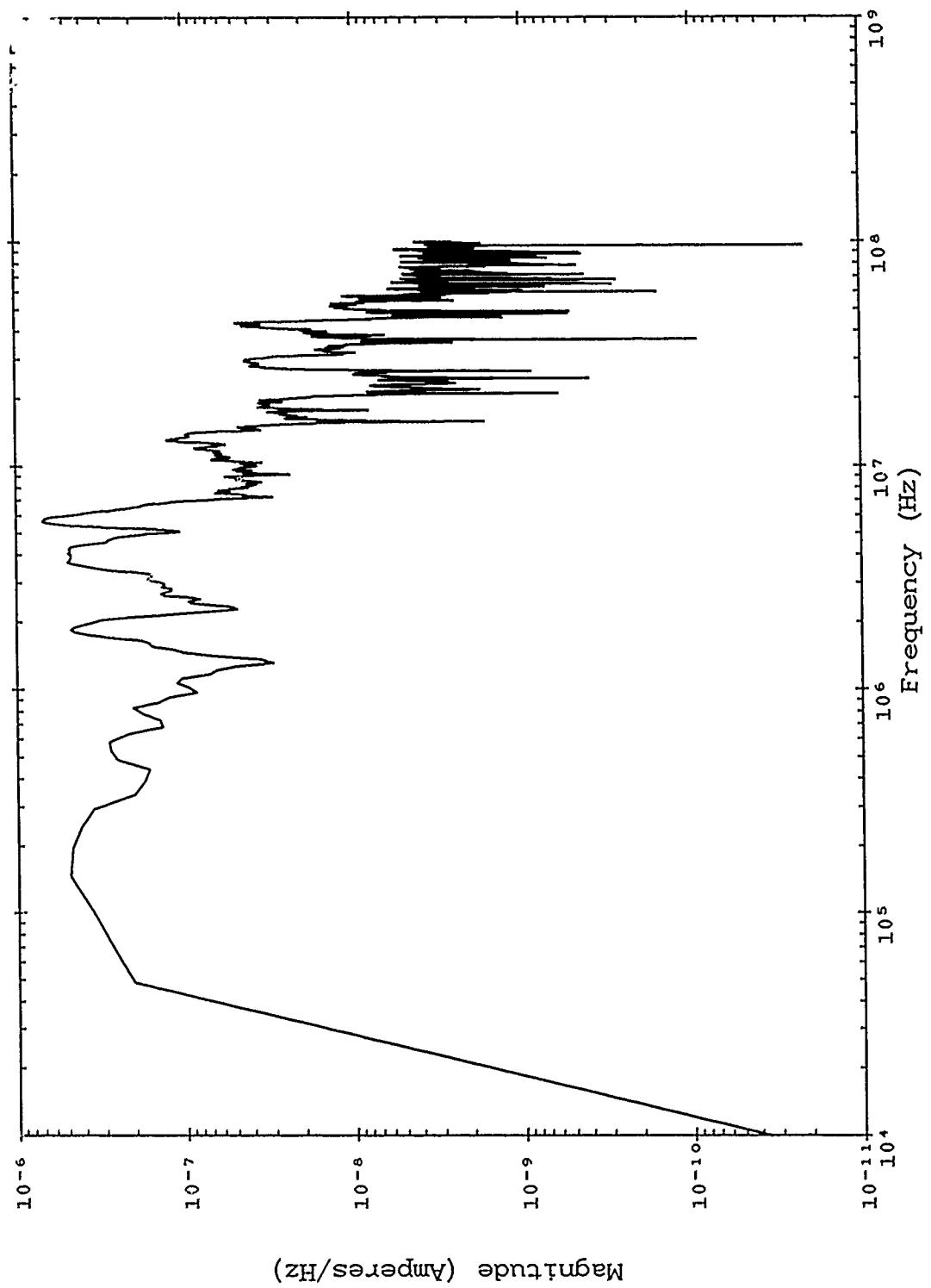


Figure B-181. Corrected TRESTLE data; TP 3919 SN 1156.

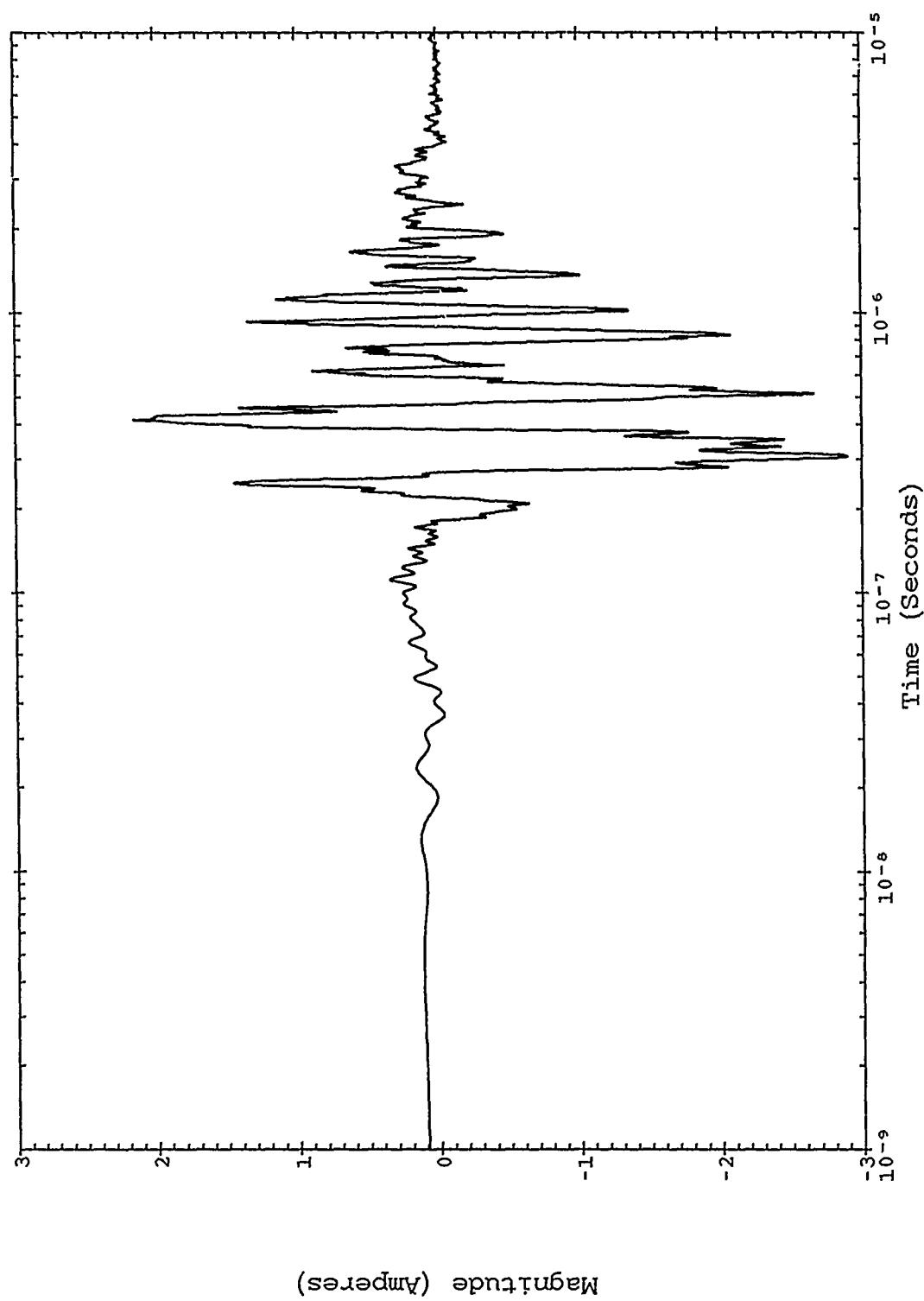


Figure B-182. Corrected TRESTLE data; TP 3919 SN 1156.

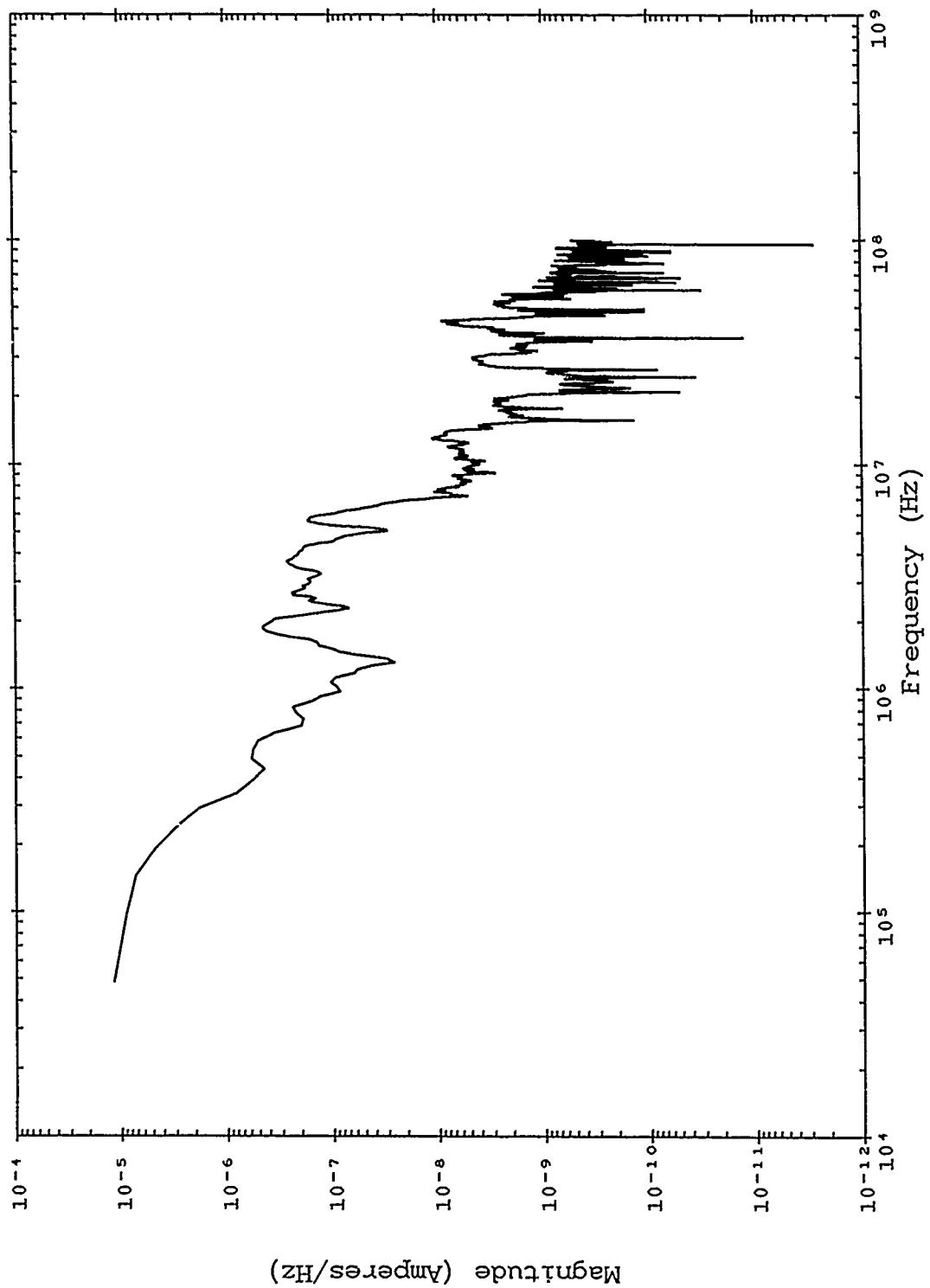


Figure B-183. Severe nearby lightning threat; TP 3919 SN 1156.

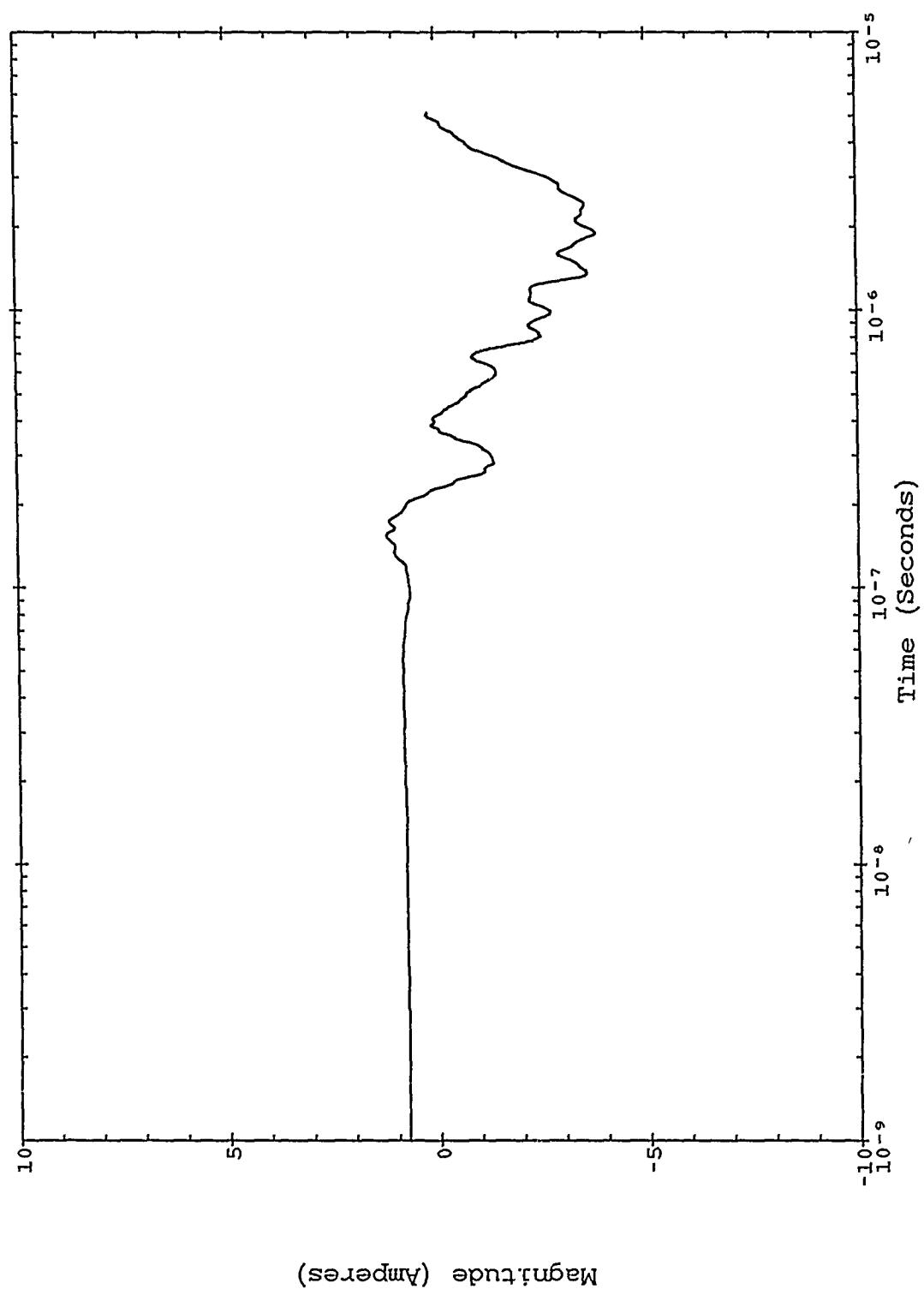


Figure B-184. Severe nearby lightning threat; TP 3919 SN 1156.

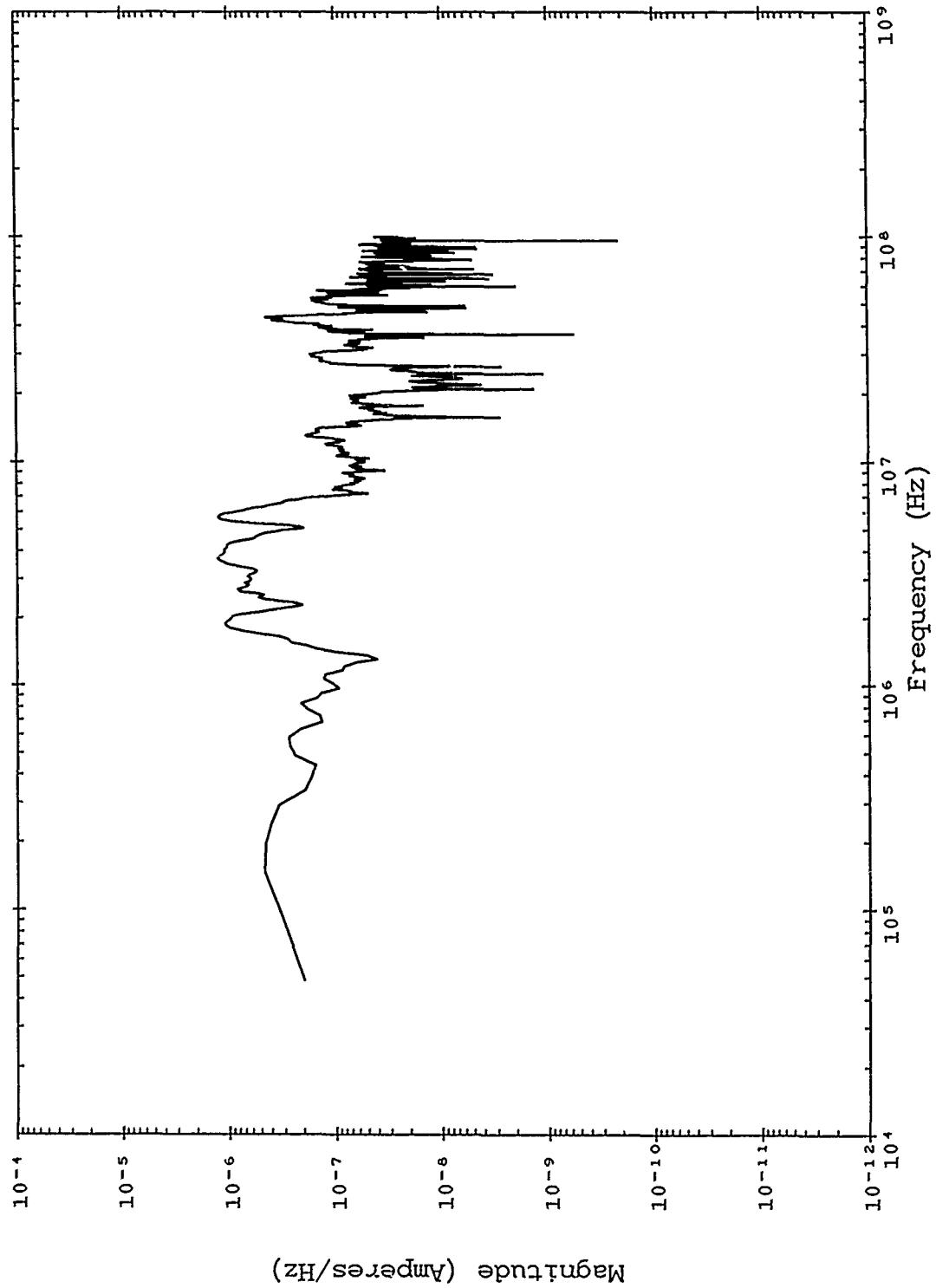


Figure B-185. Double exponential threat; TP 3919 SN 1156.

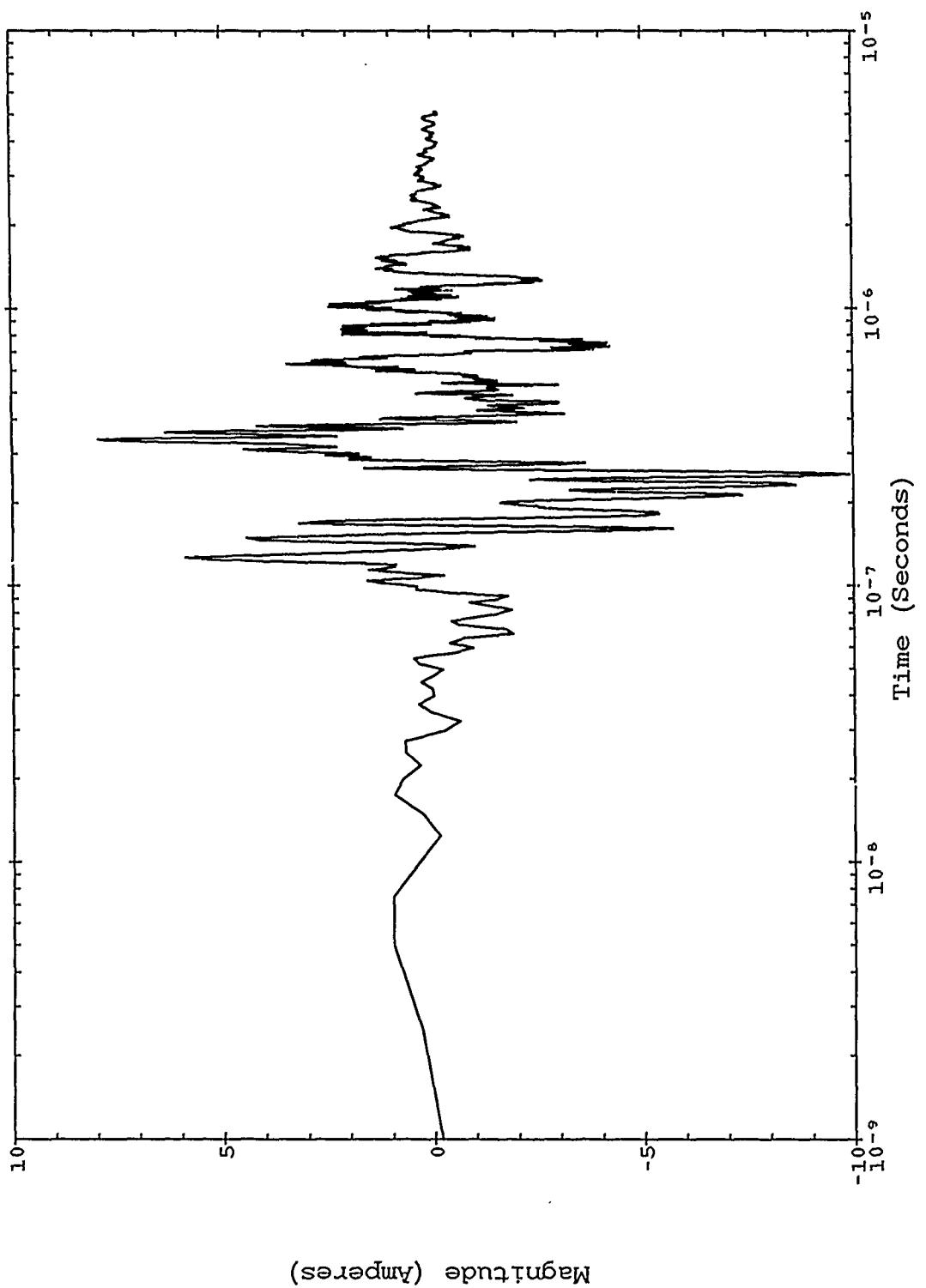


Figure B-186. Double exponential threat; TP 3919 SN 1156.

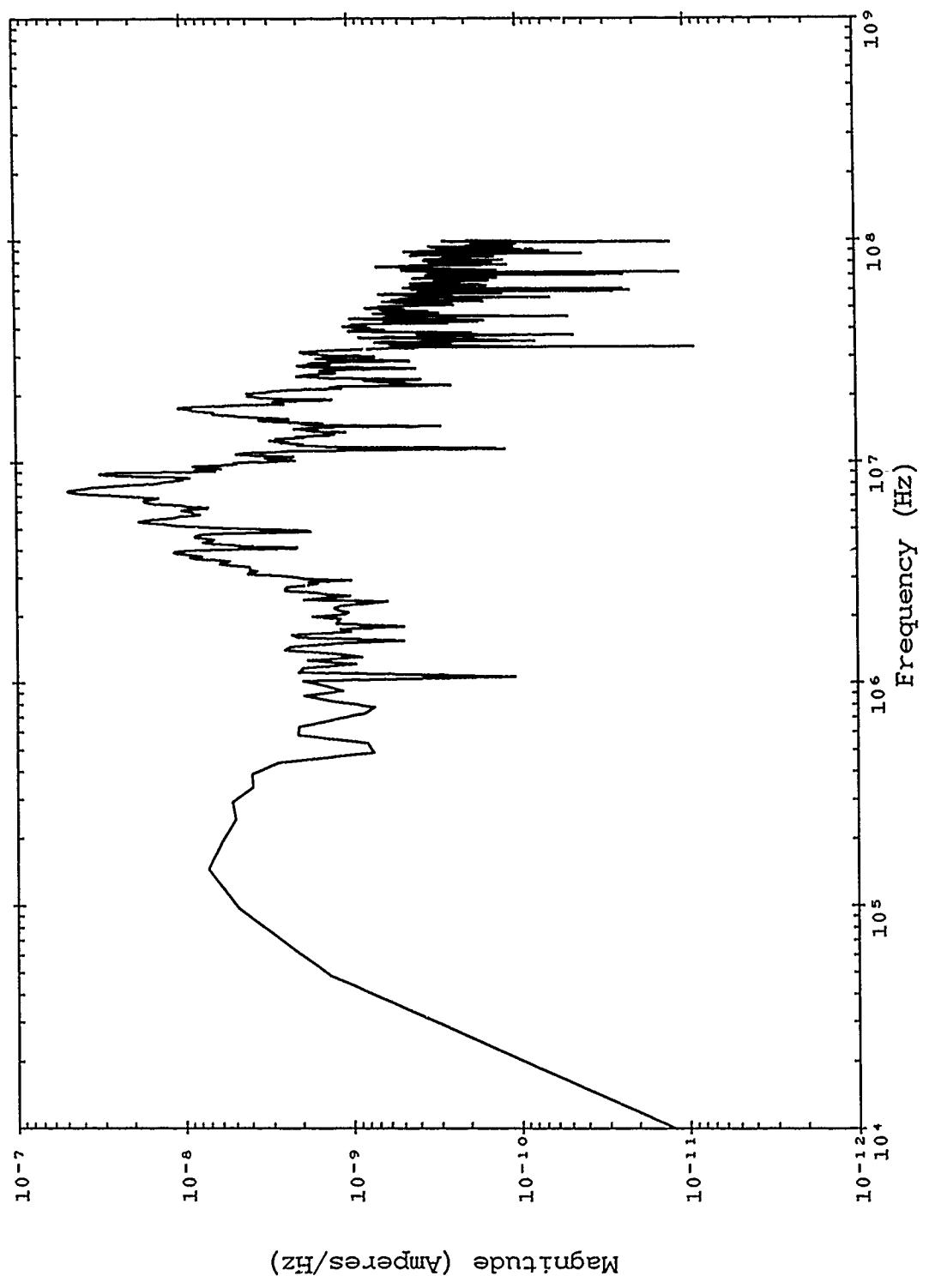


Figure B-187. Corrected TRESTLE data; TP 4050 SN 1680.

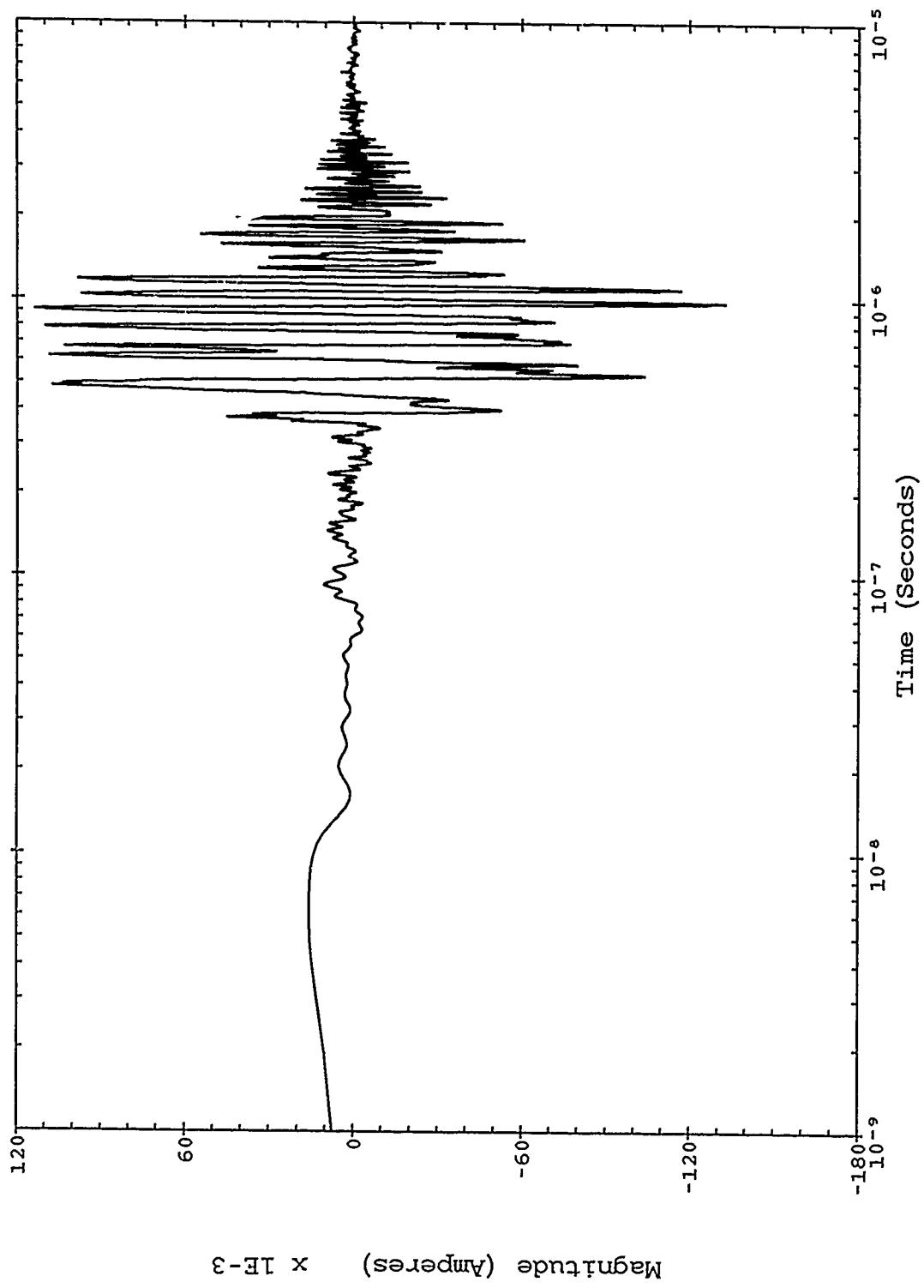


Figure B-188. Corrected TRESTLE data; TP 4050 SN 1680.

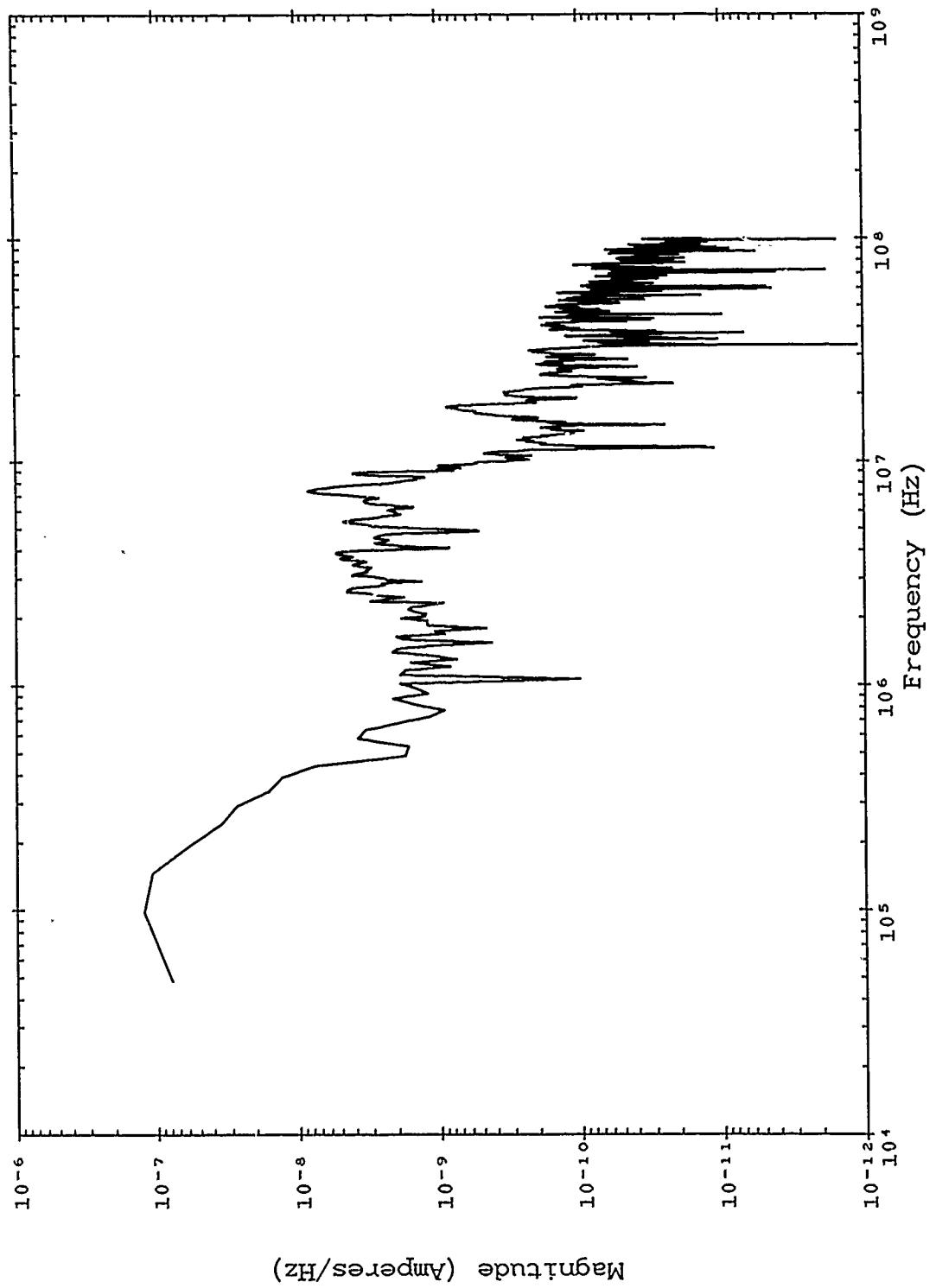


Figure B-189. Severe nearby lightning threat; TP 4050 SN 1680.

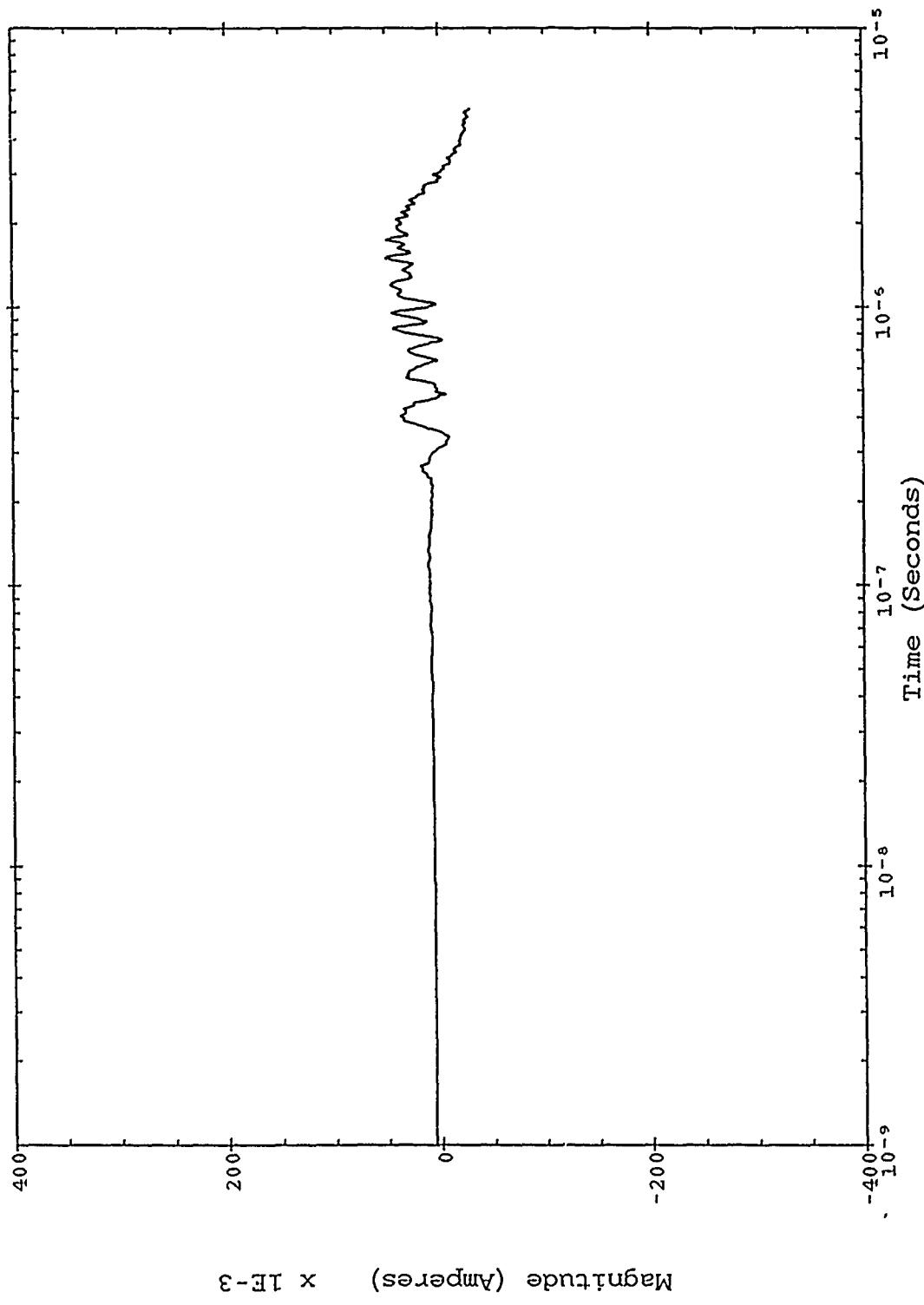


Figure B-190. Severe nearby lightning threat; TP 4050 SN 1680.

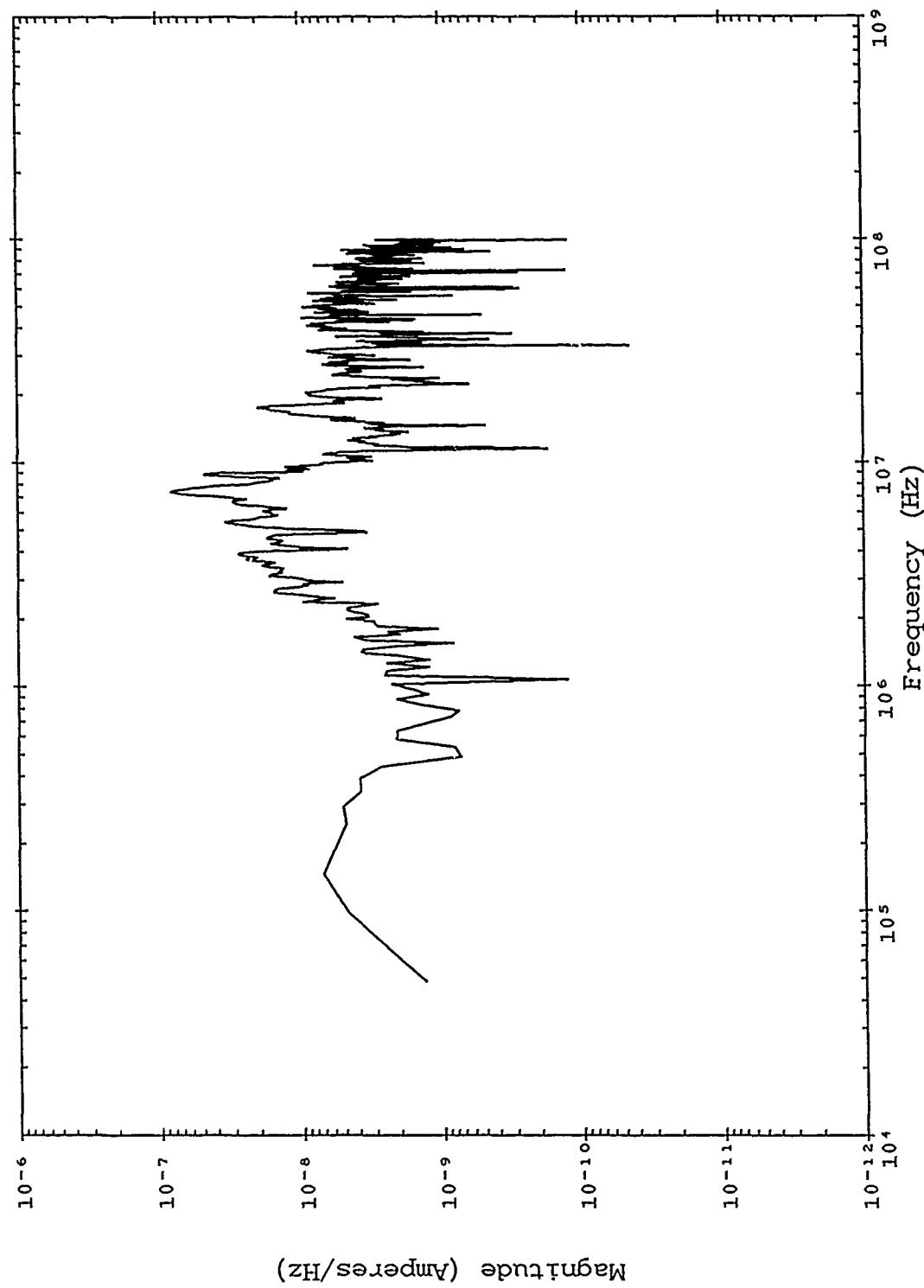


Figure B-191. Double exponential threat; TP 4050 SN 1680.

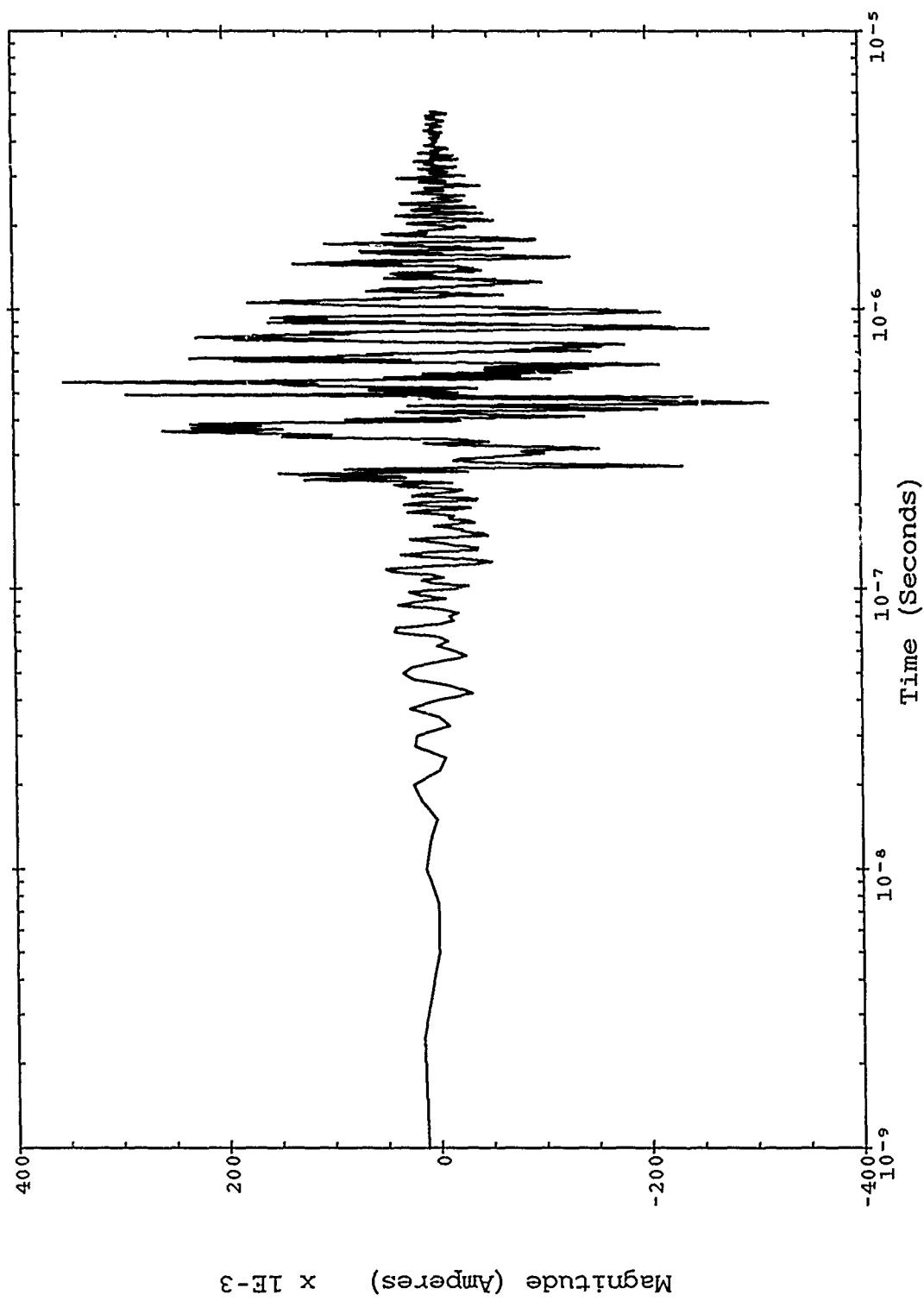


Figure B-192. Double exponential threat; TP 4050 SN 1680.

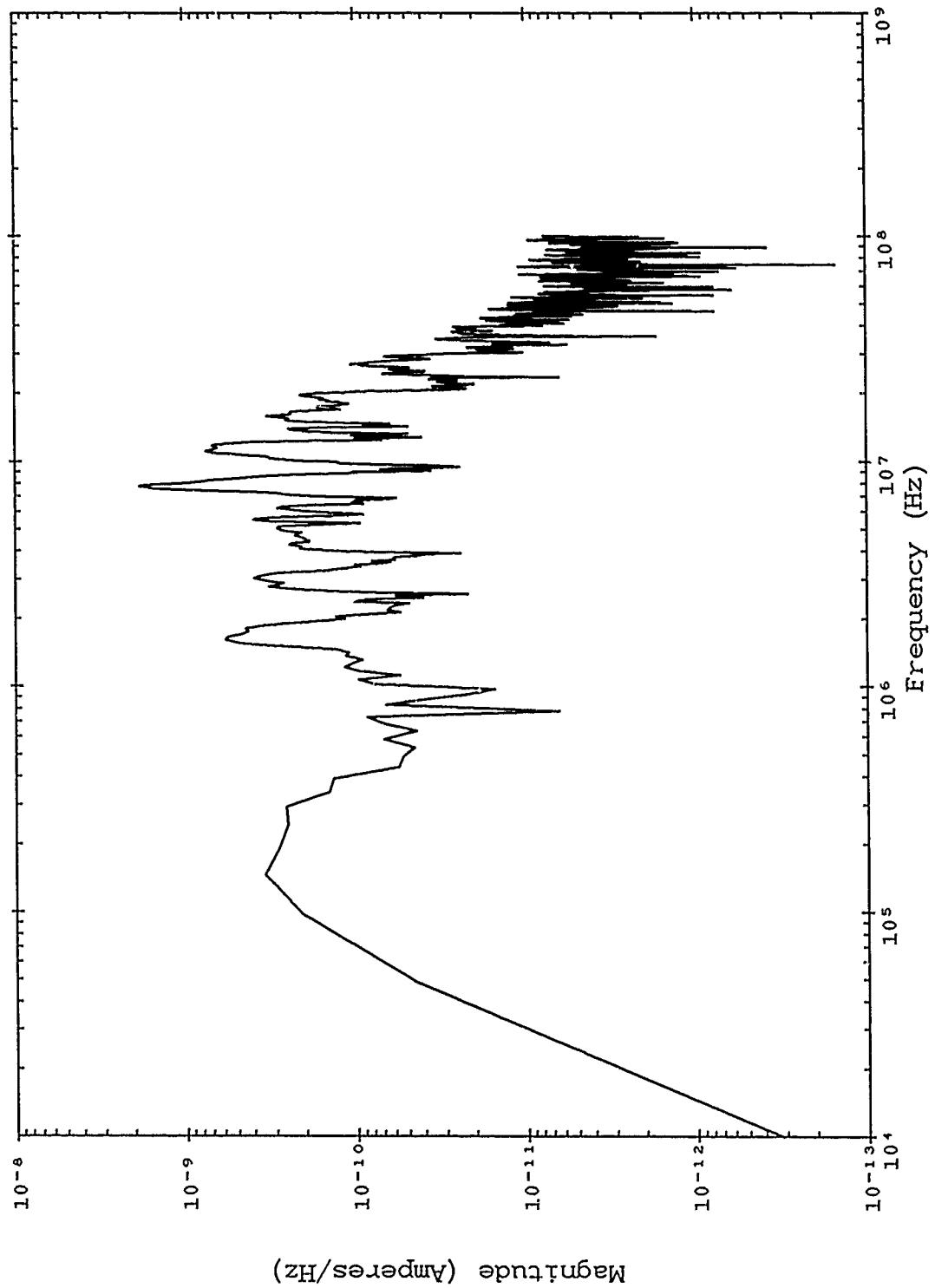


Figure B-193. Corrected TRESTLE data; TP 4225 SN 2671.

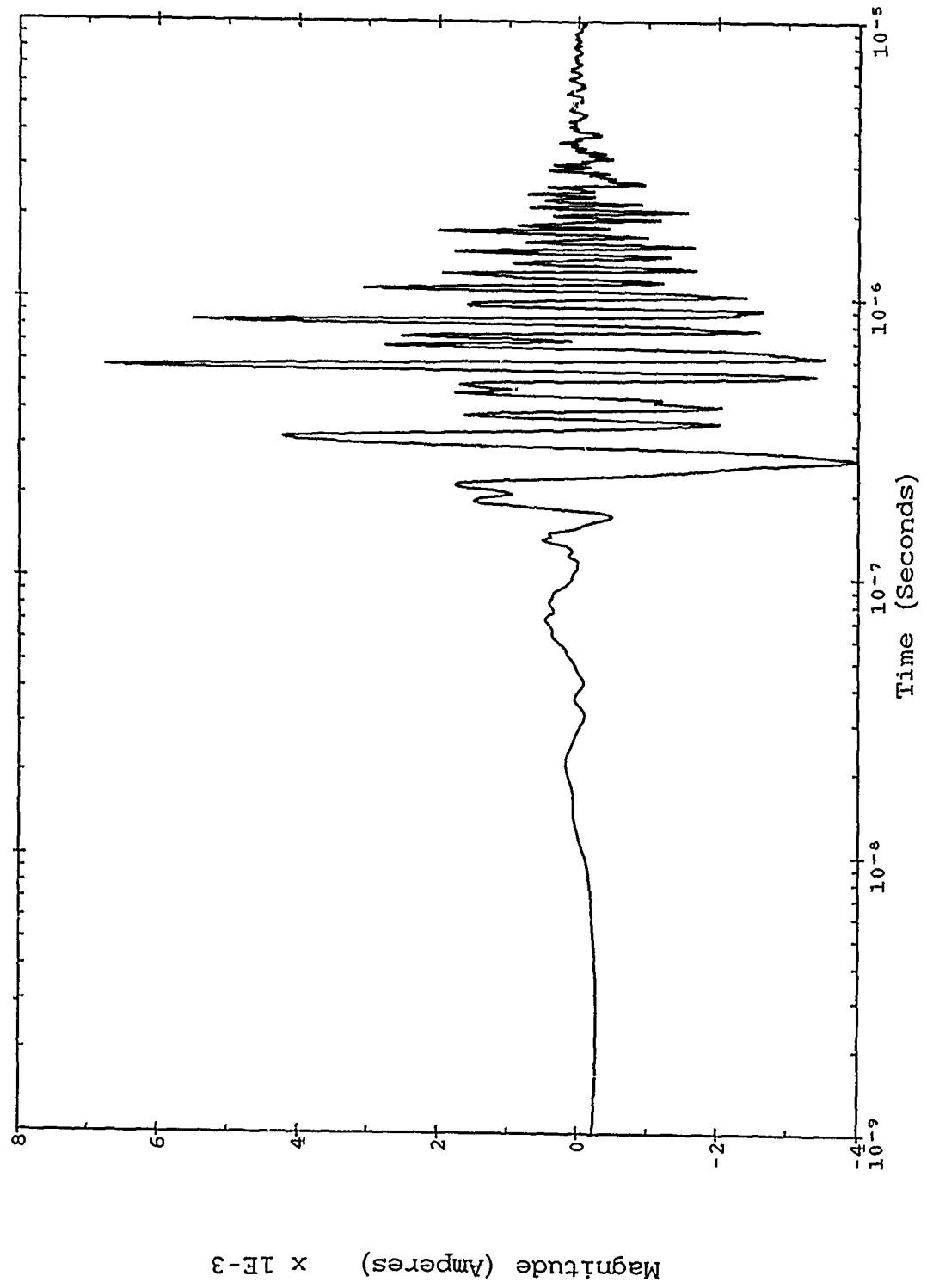


Figure B-194. Corrected TRESTLE data; TP 4225 SN 2671.

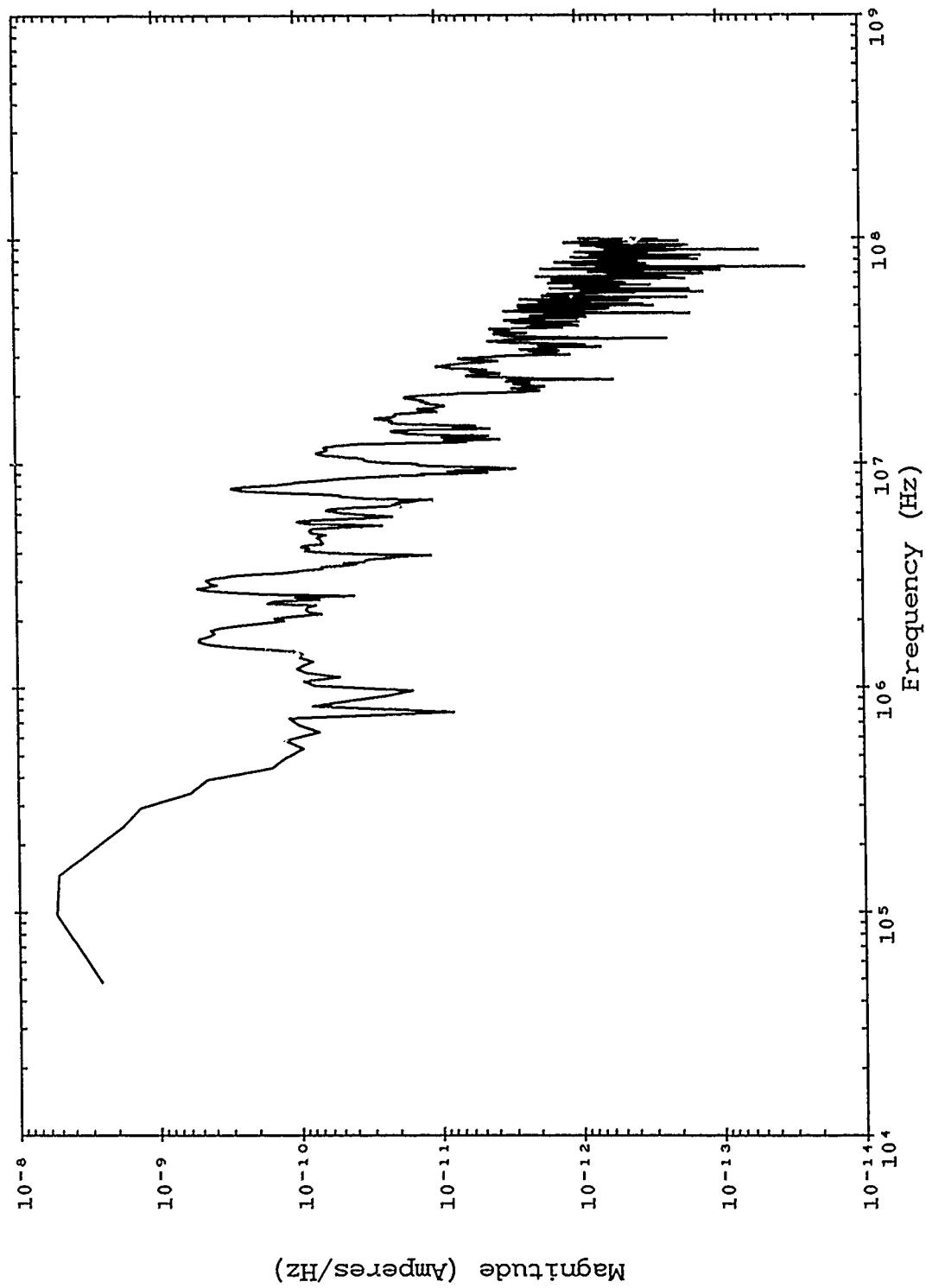


Figure B-195. Severe nearby lightning threat; TP 4225 SN 2671.

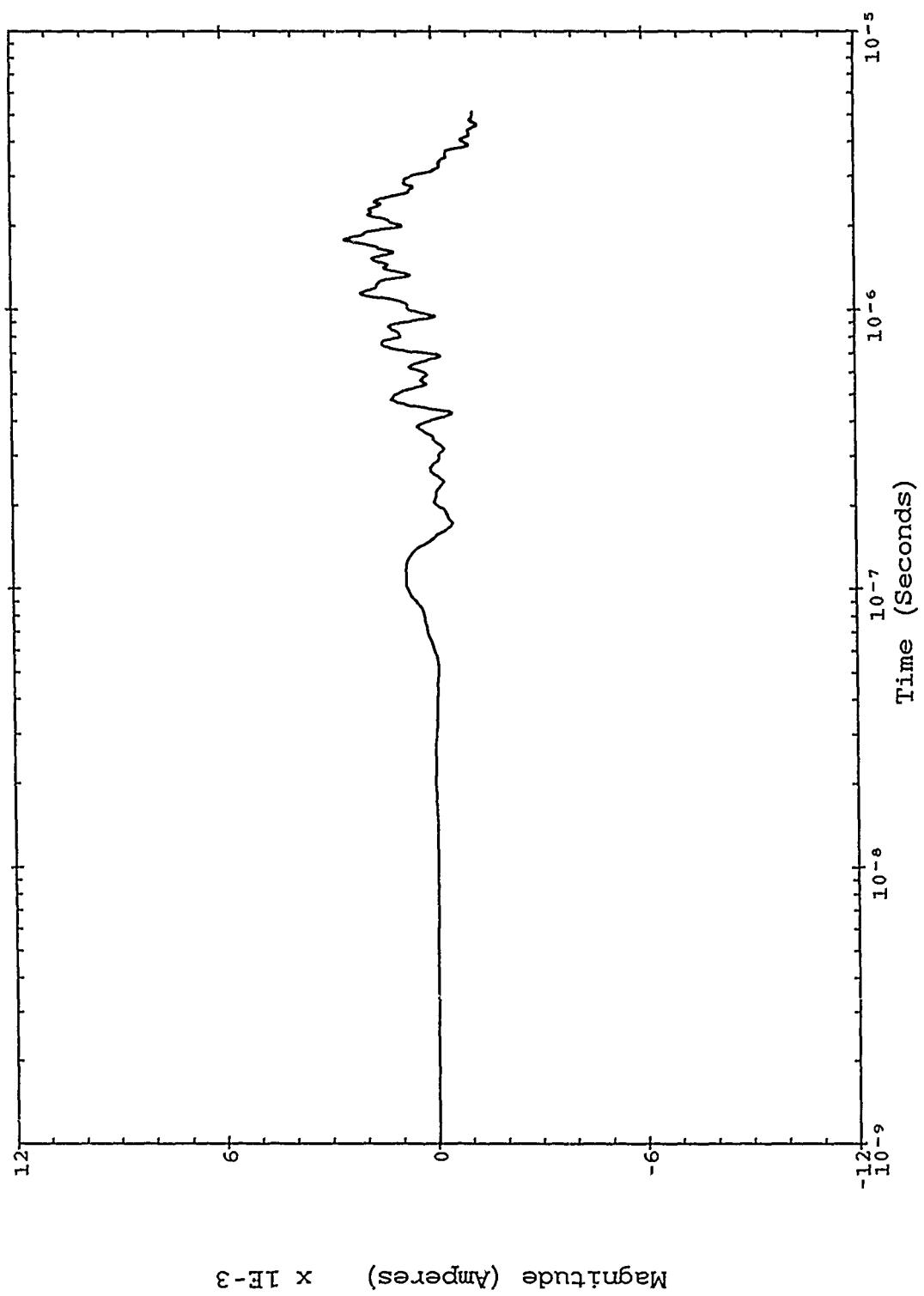


Figure B-196. Severe nearby lightning threat; TP 4225 SN 2671.

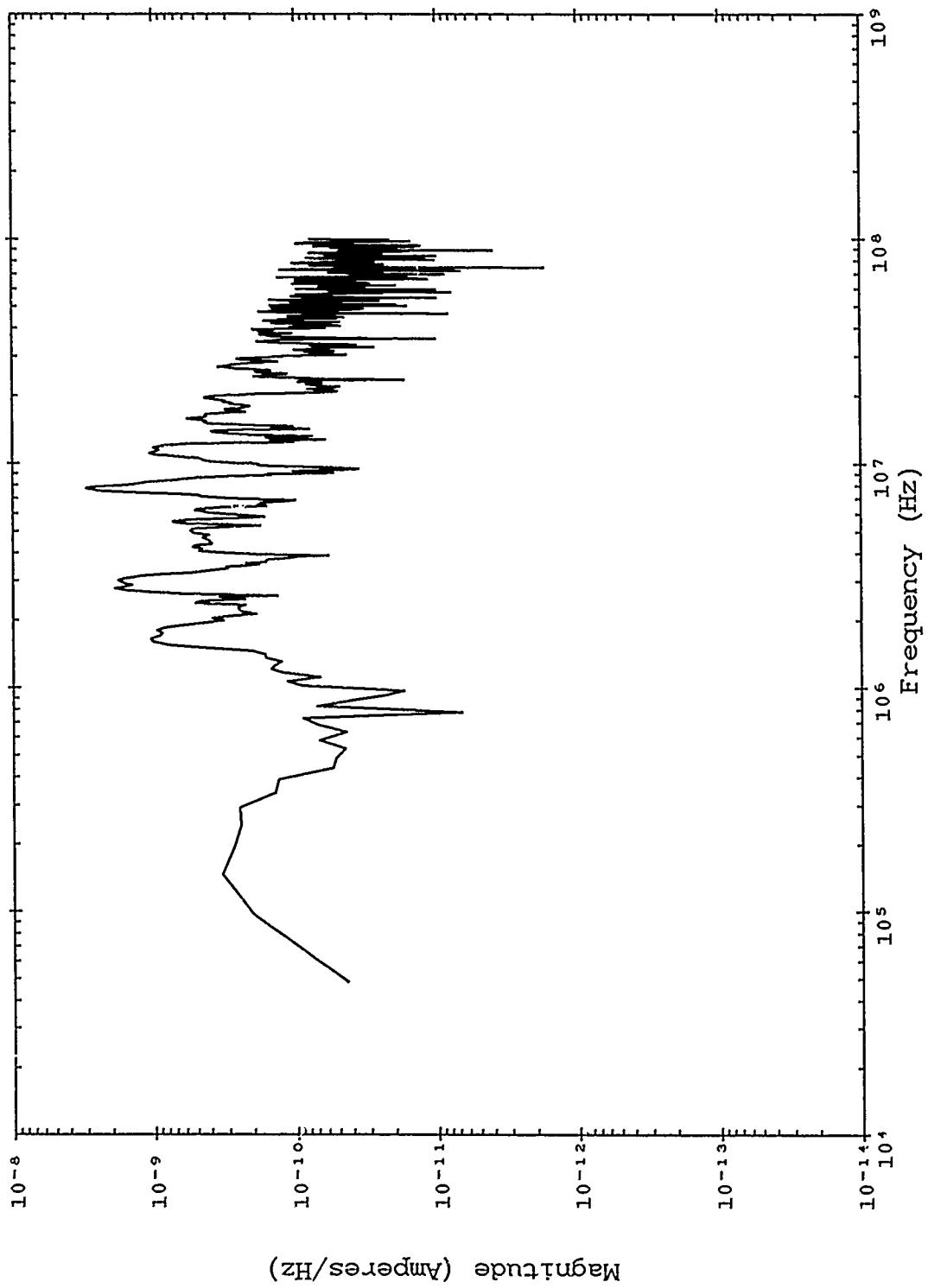


Figure B-197. Double exponential threat; TP 4225 SN 2671.

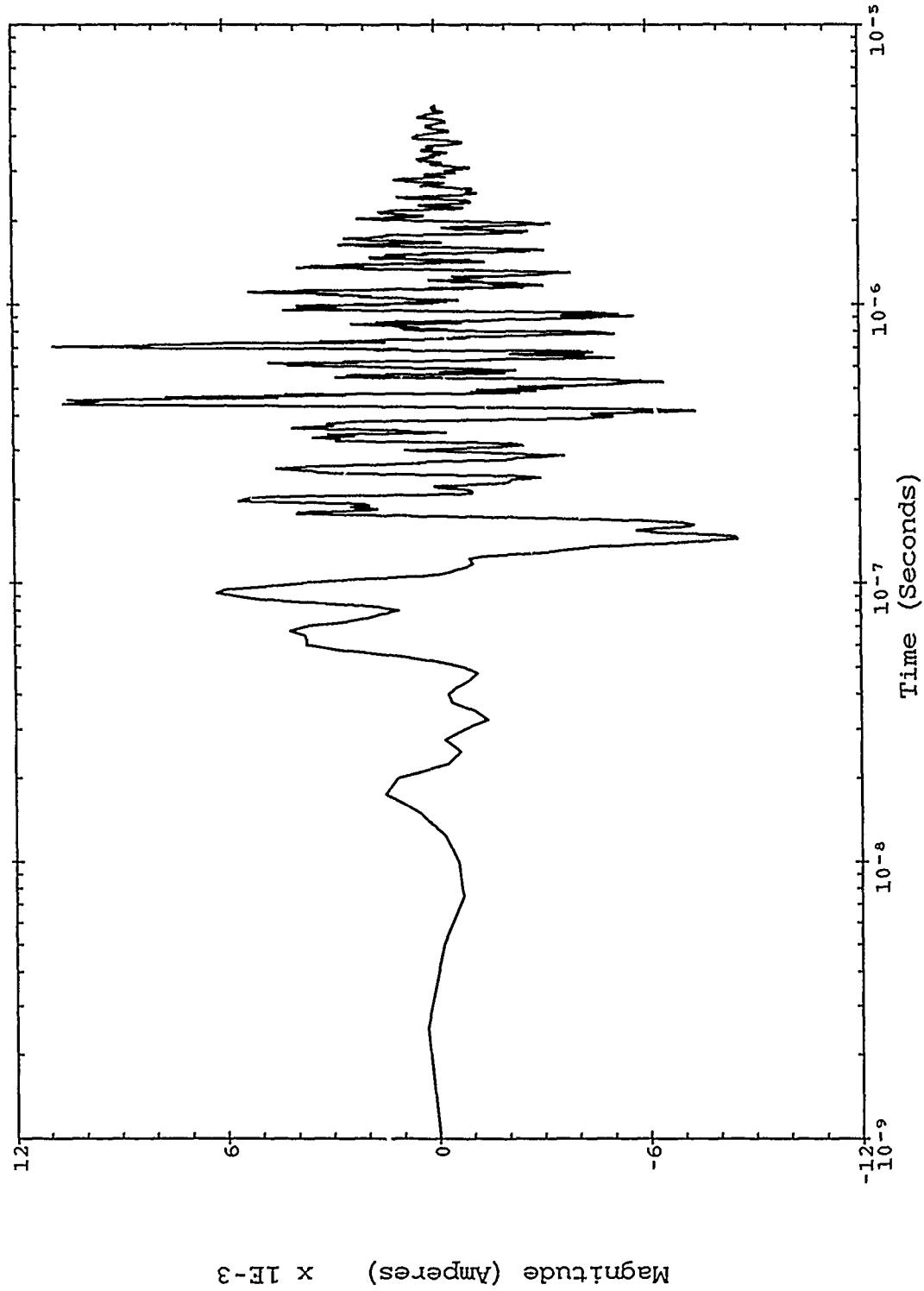


Figure B-198. Double exponential threat; TP 4225 SN 2671.

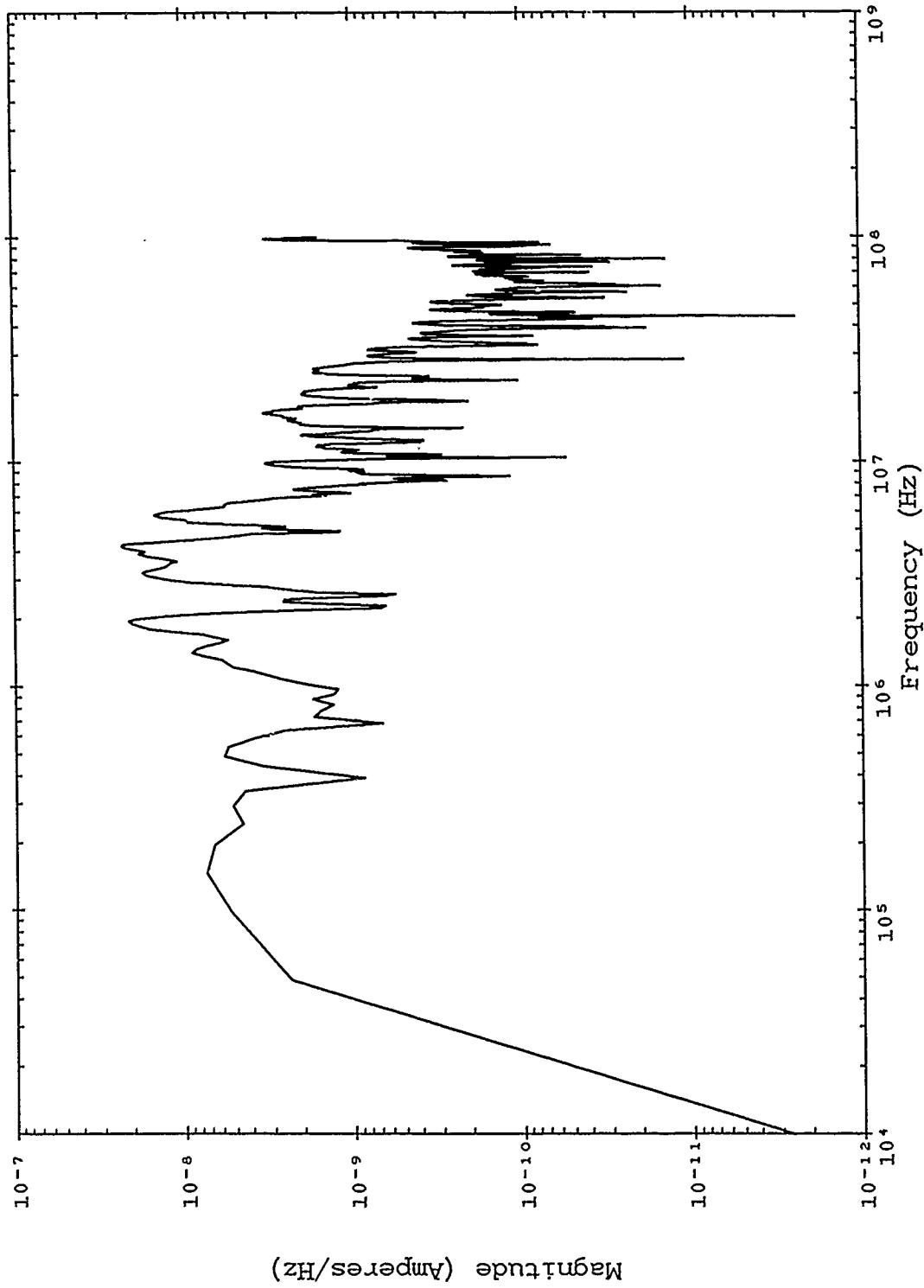


Figure B-199. Corrected TRESTLE data; TP 4309 SN 2653.

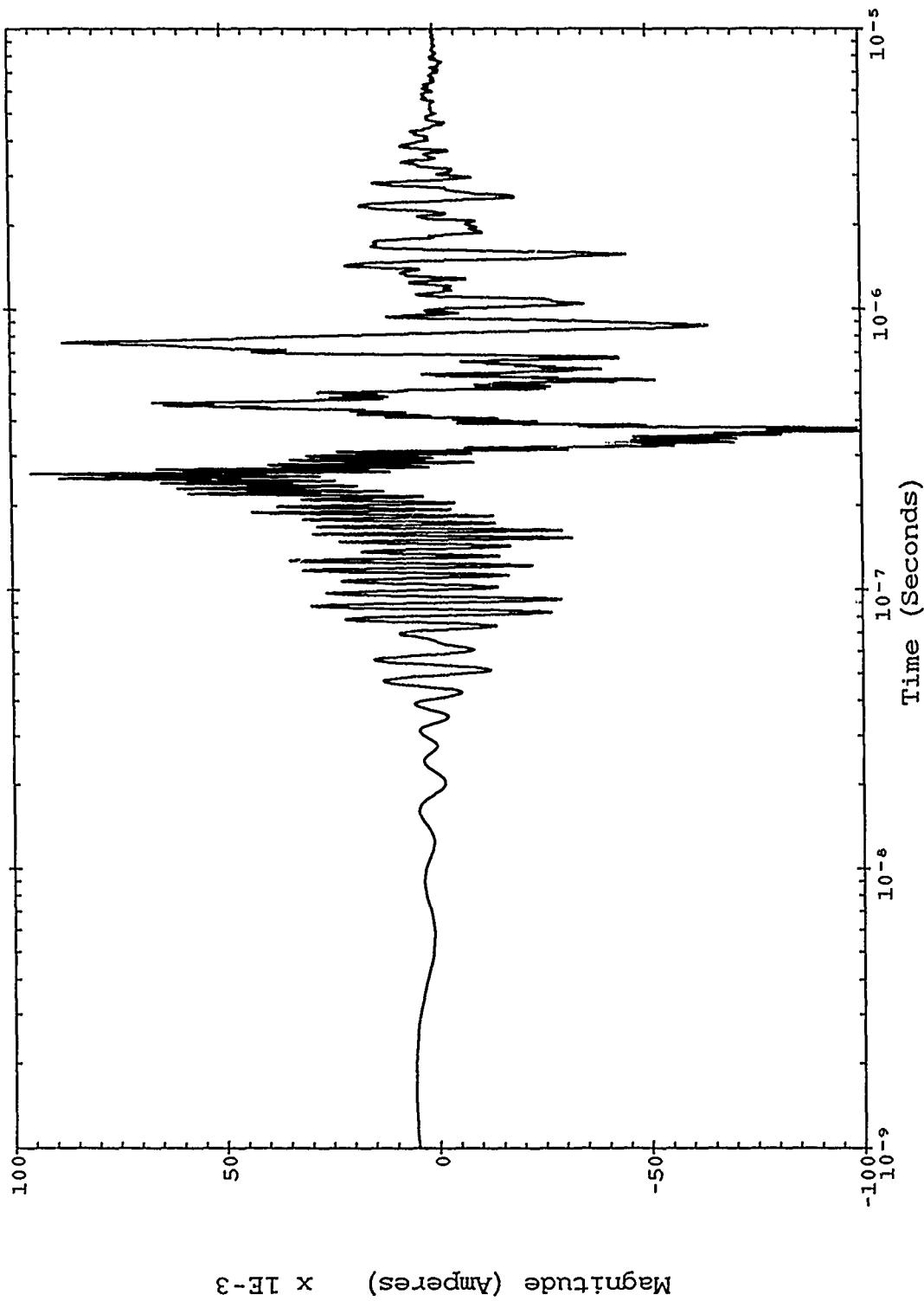


Figure B-200. Corrected TRESTLE data; TP 4309 SN 2653.

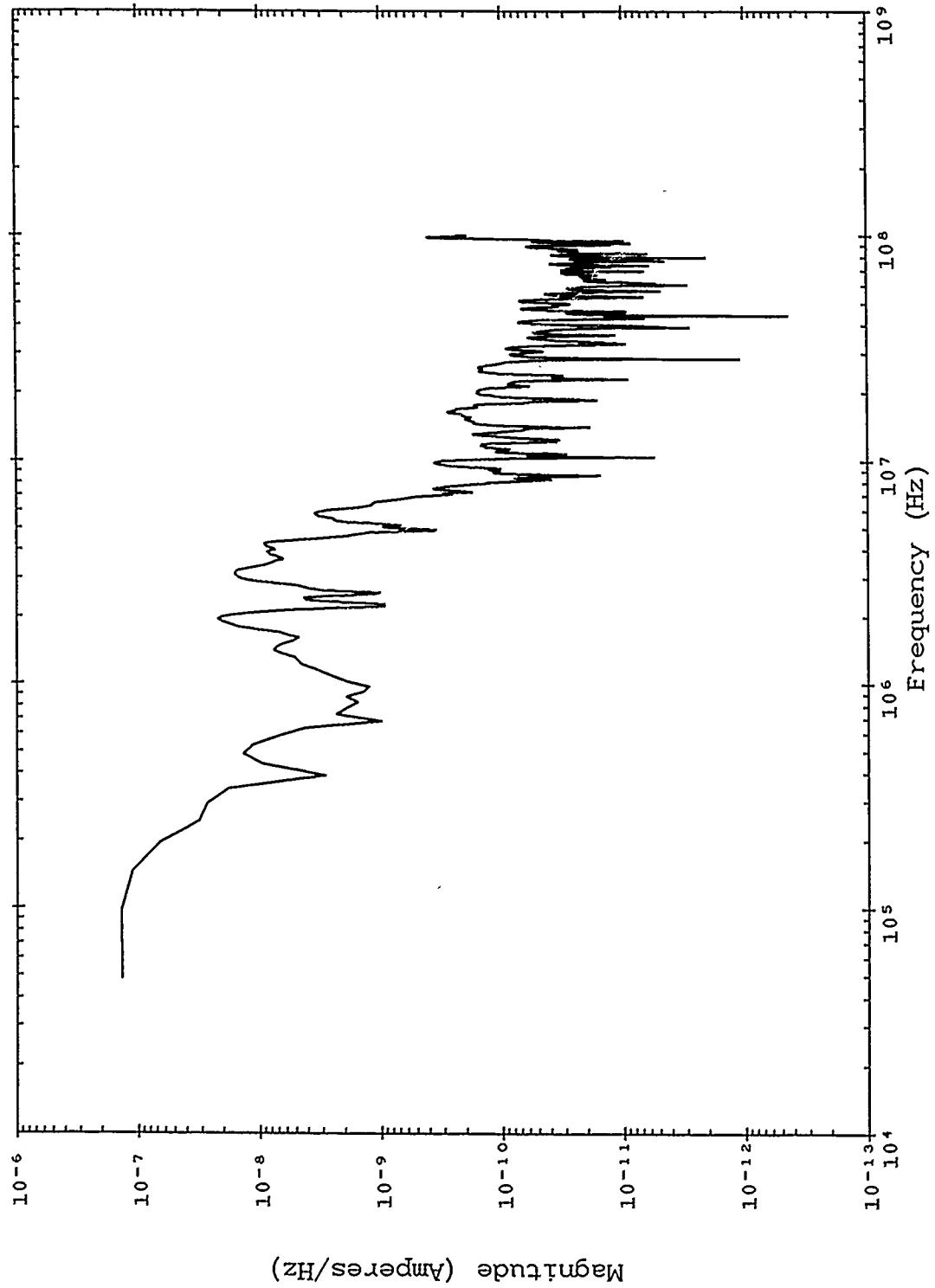


Figure B-201. Severe nearby lightning threat; TP 4309 SN 2653.

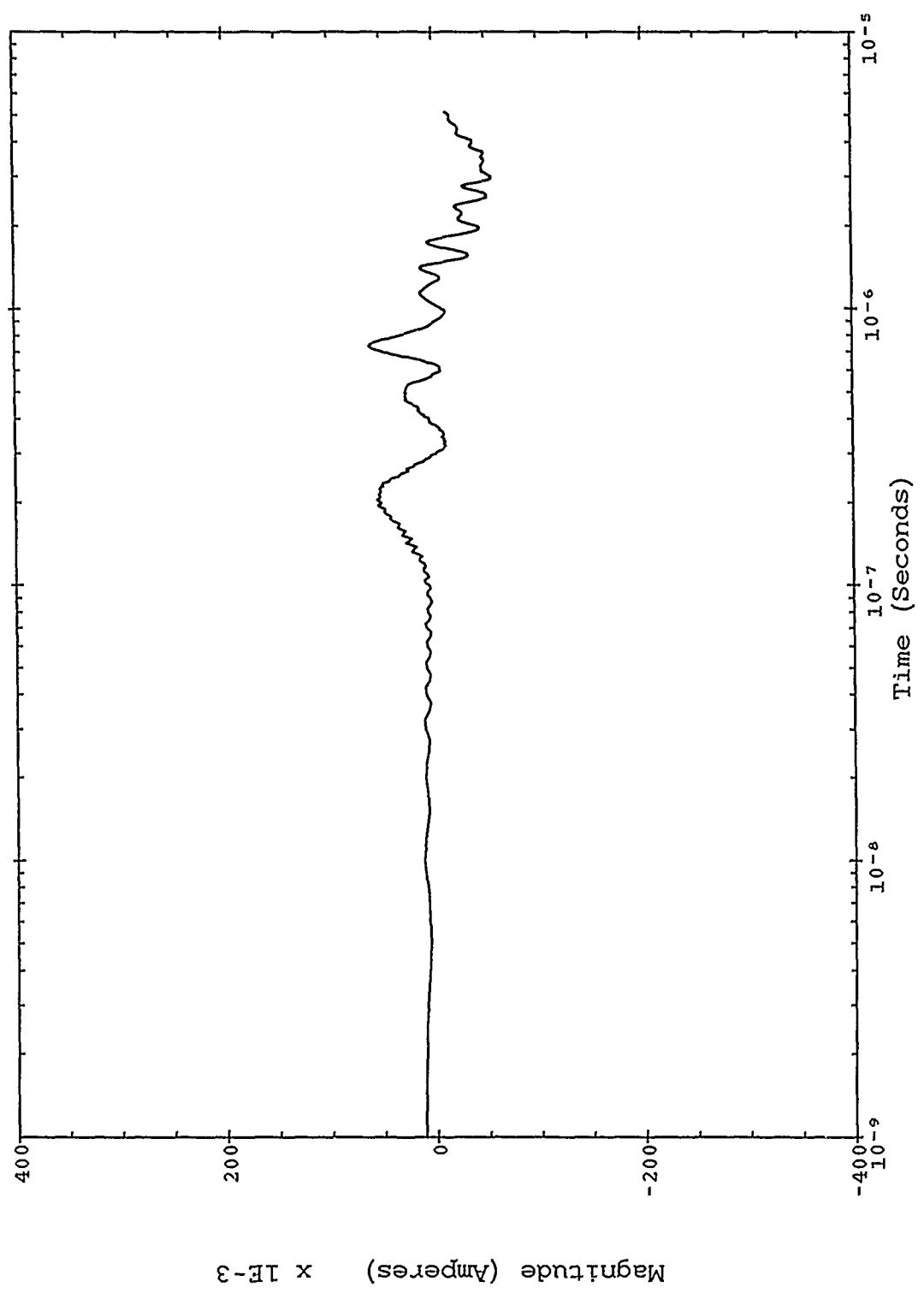


Figure B-202. Severe nearby lightning threat; TP 4309 SN 2653.

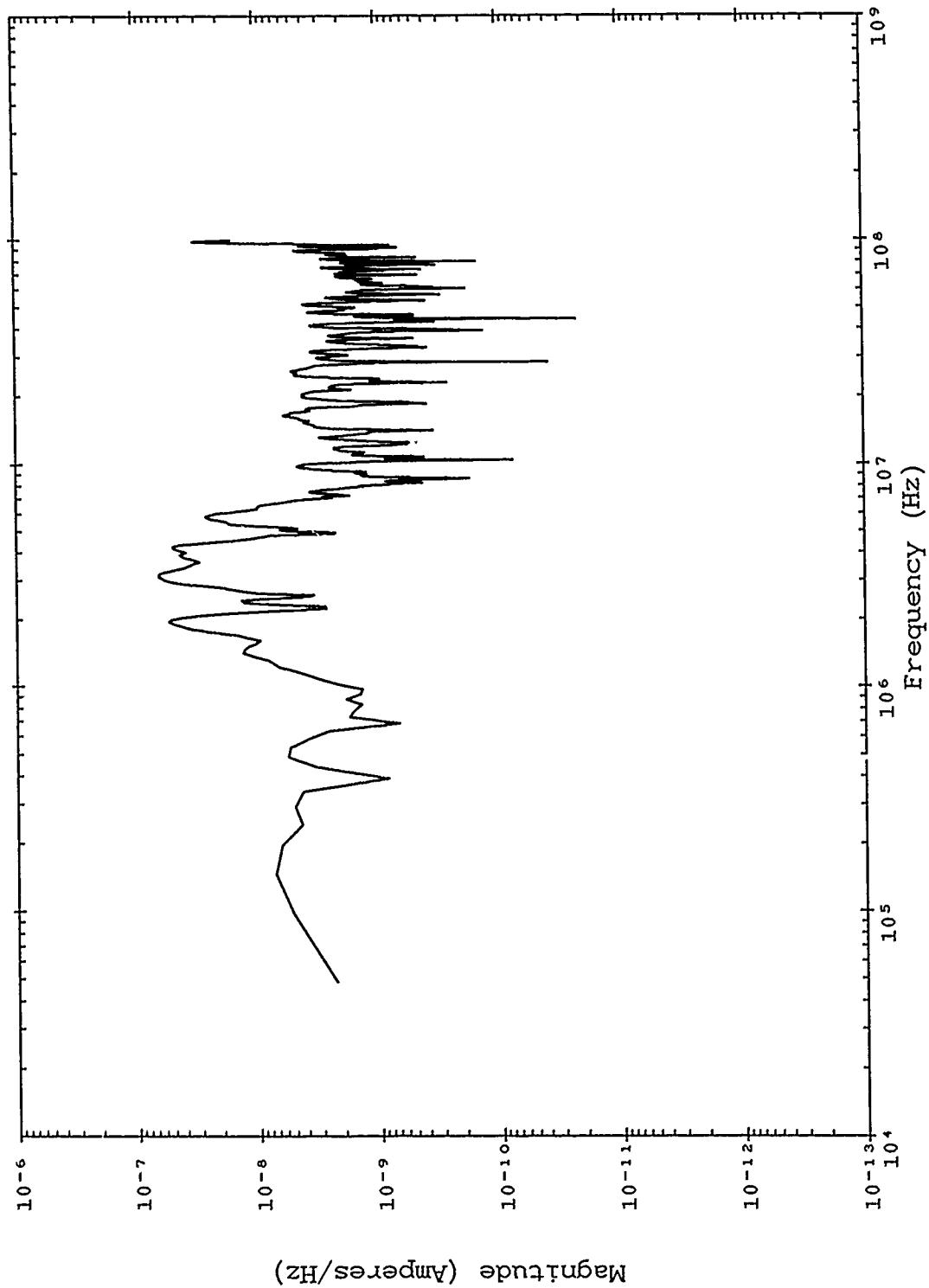


Figure B-203. Double exponential threat; TP 4309 SN 2653.

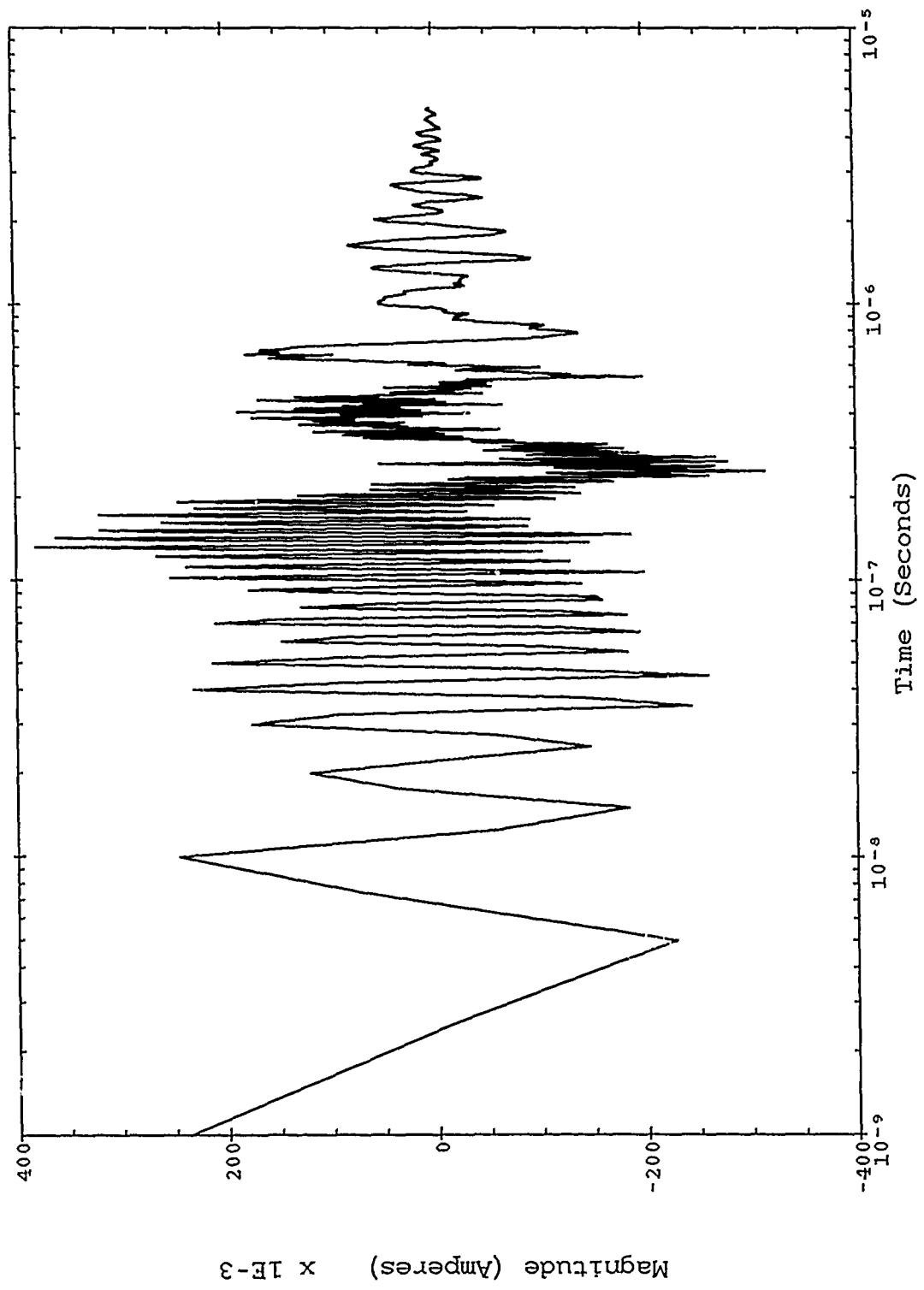


Figure B-204. Double exponential threat; TP 4309 SN 2653.

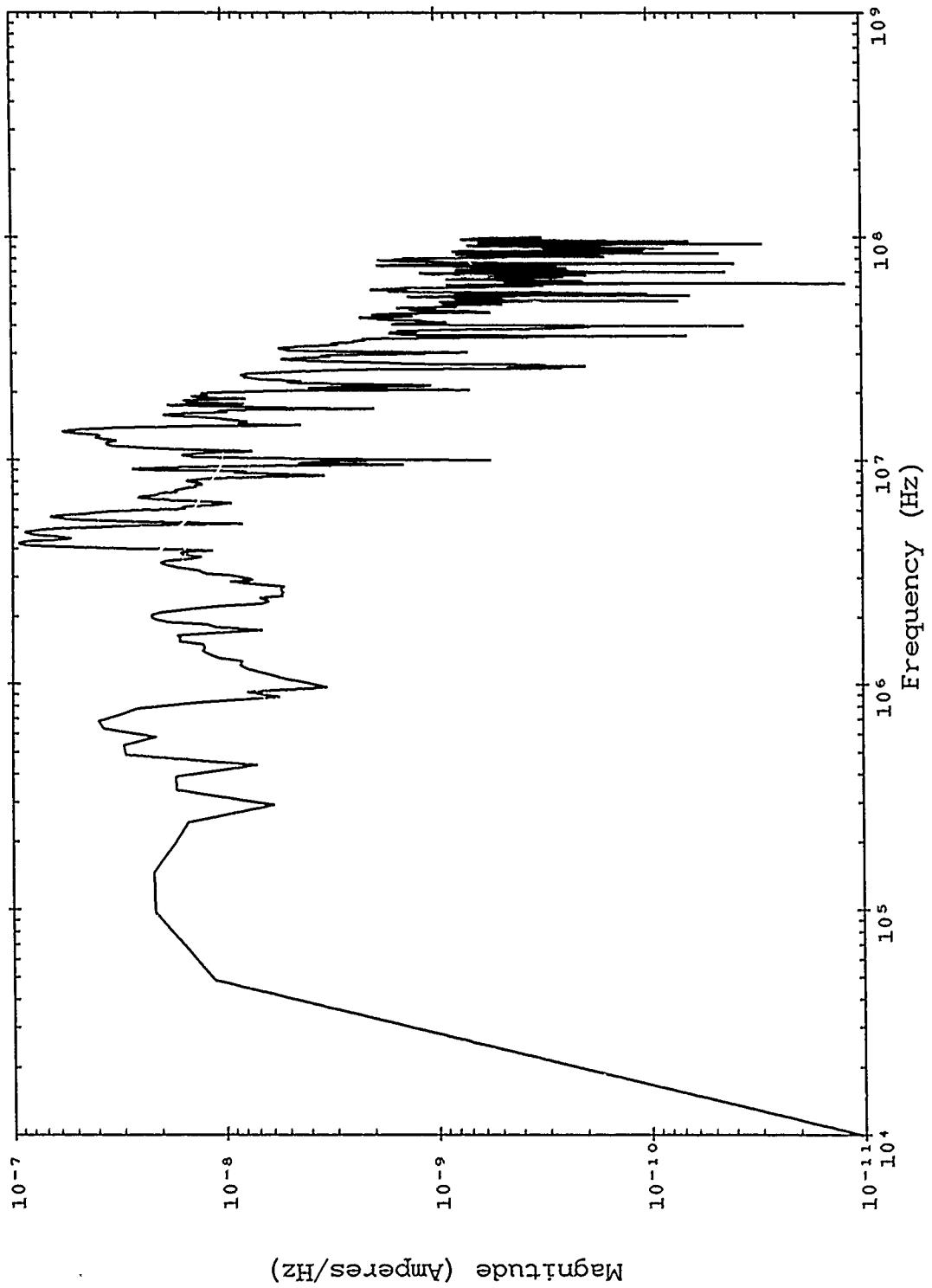


Figure B-205. Corrected TRESTLE data; TP 4597 SN 2436.

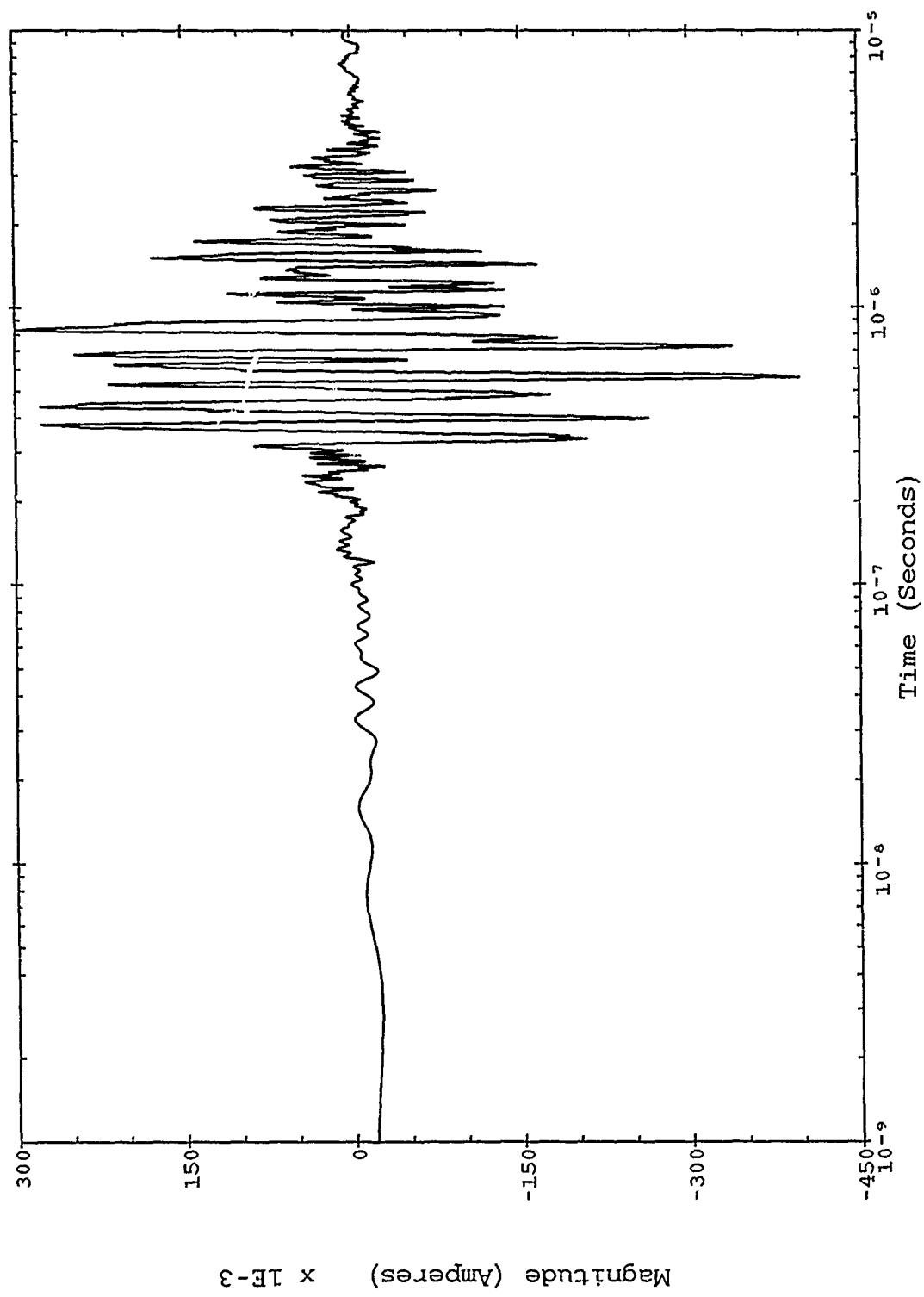


Figure B-206. Corrected TRESTLE data; TP 4597 SN 2436.

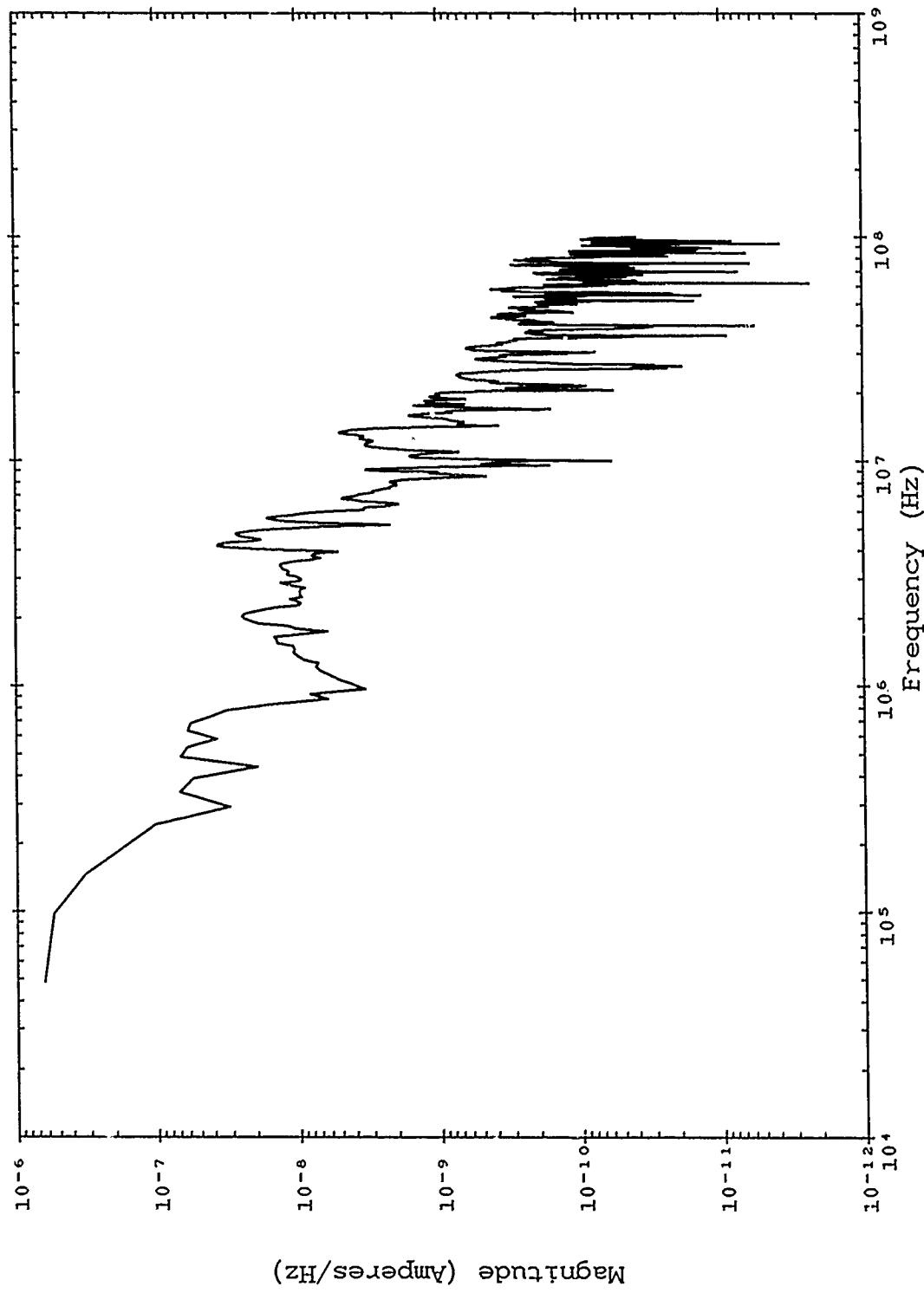


Figure B-207. Severe nearby lightning threat; TP 4597 SN 2436.

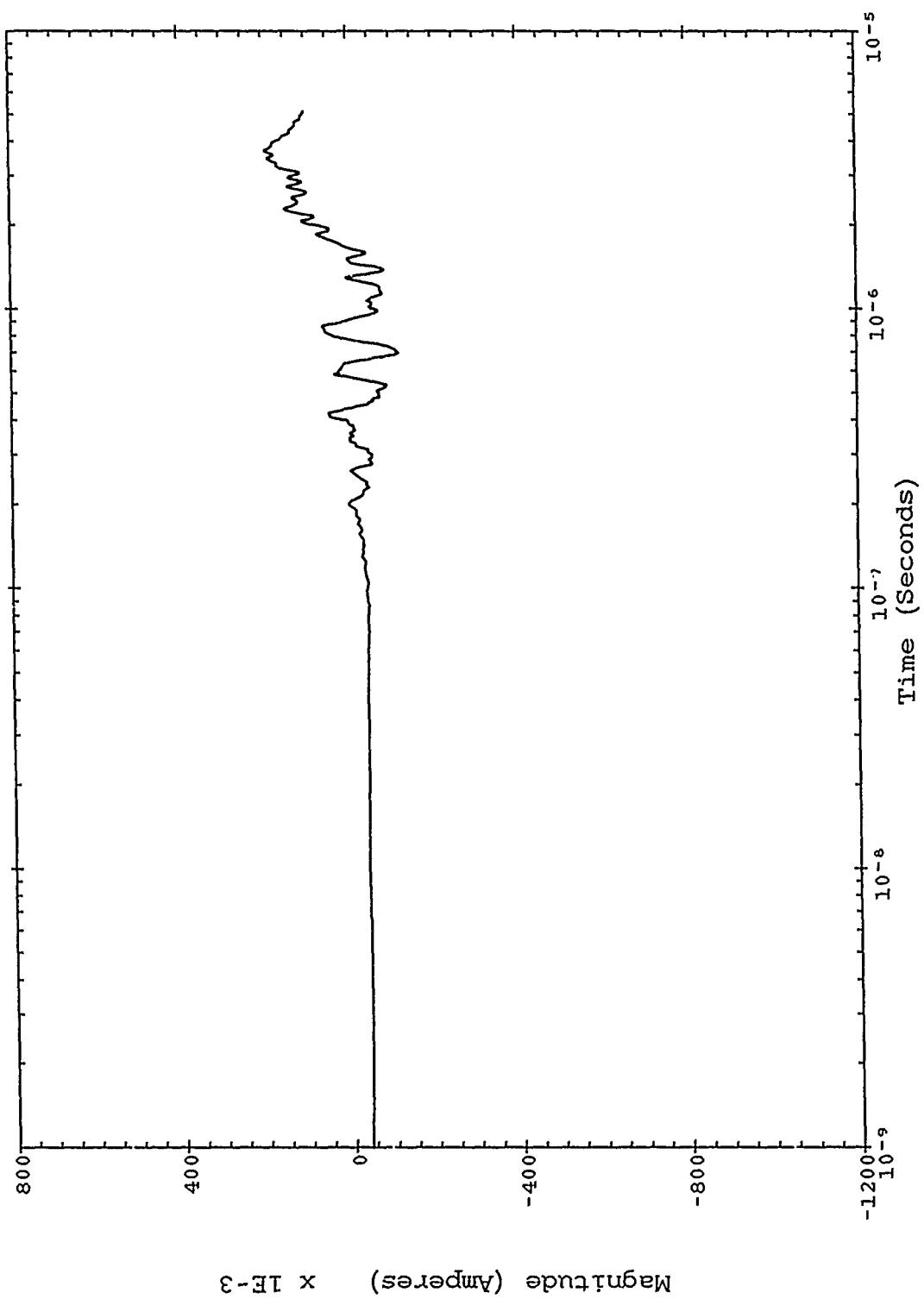


Figure B-208. Severe nearby lightning threat; TP 4597 SN 2436.

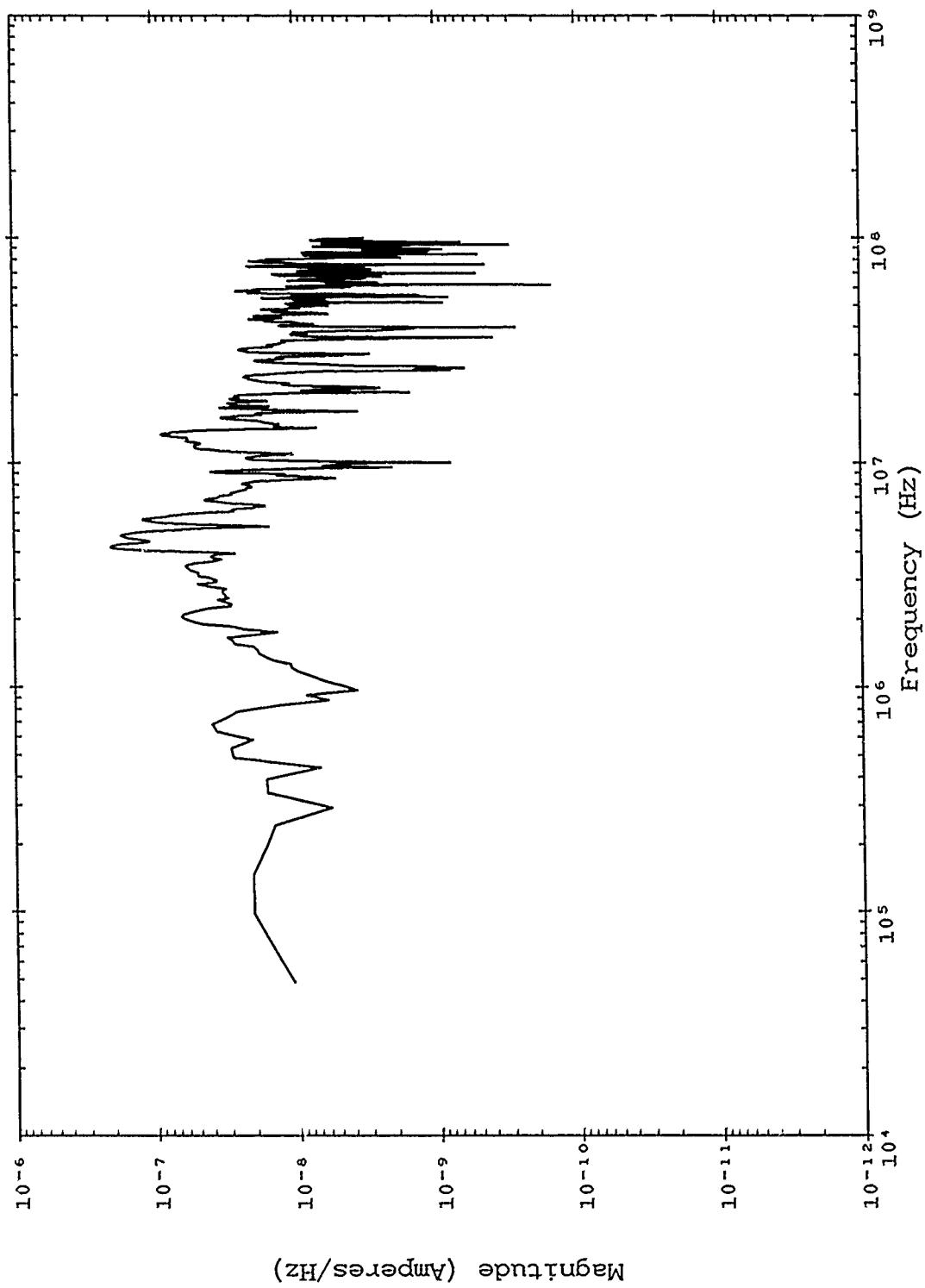


Figure B-209. Double exponential threat; TP 4597 SN 2436.

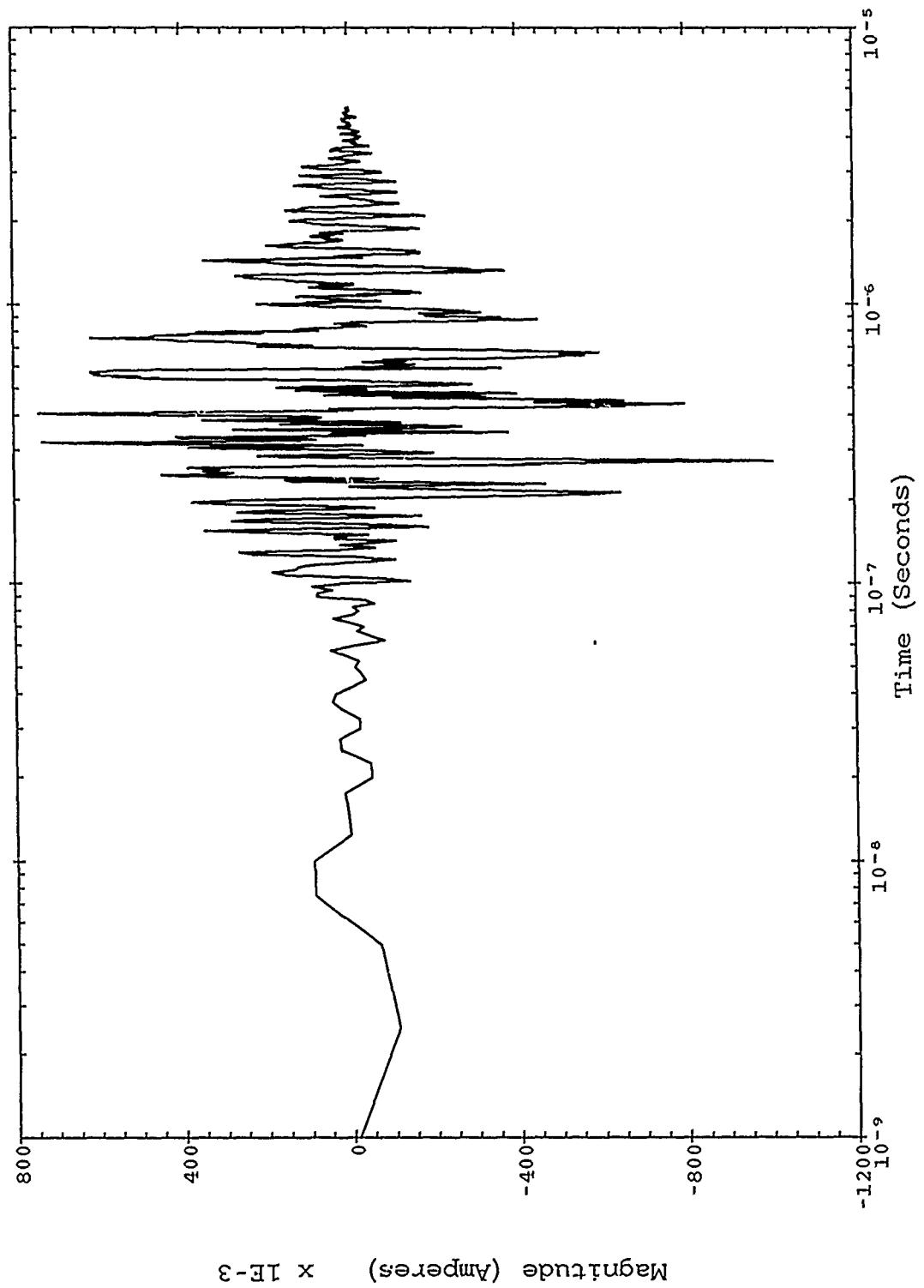


Figure B-210. Double exponential threat; TP 4597 SN 2436.

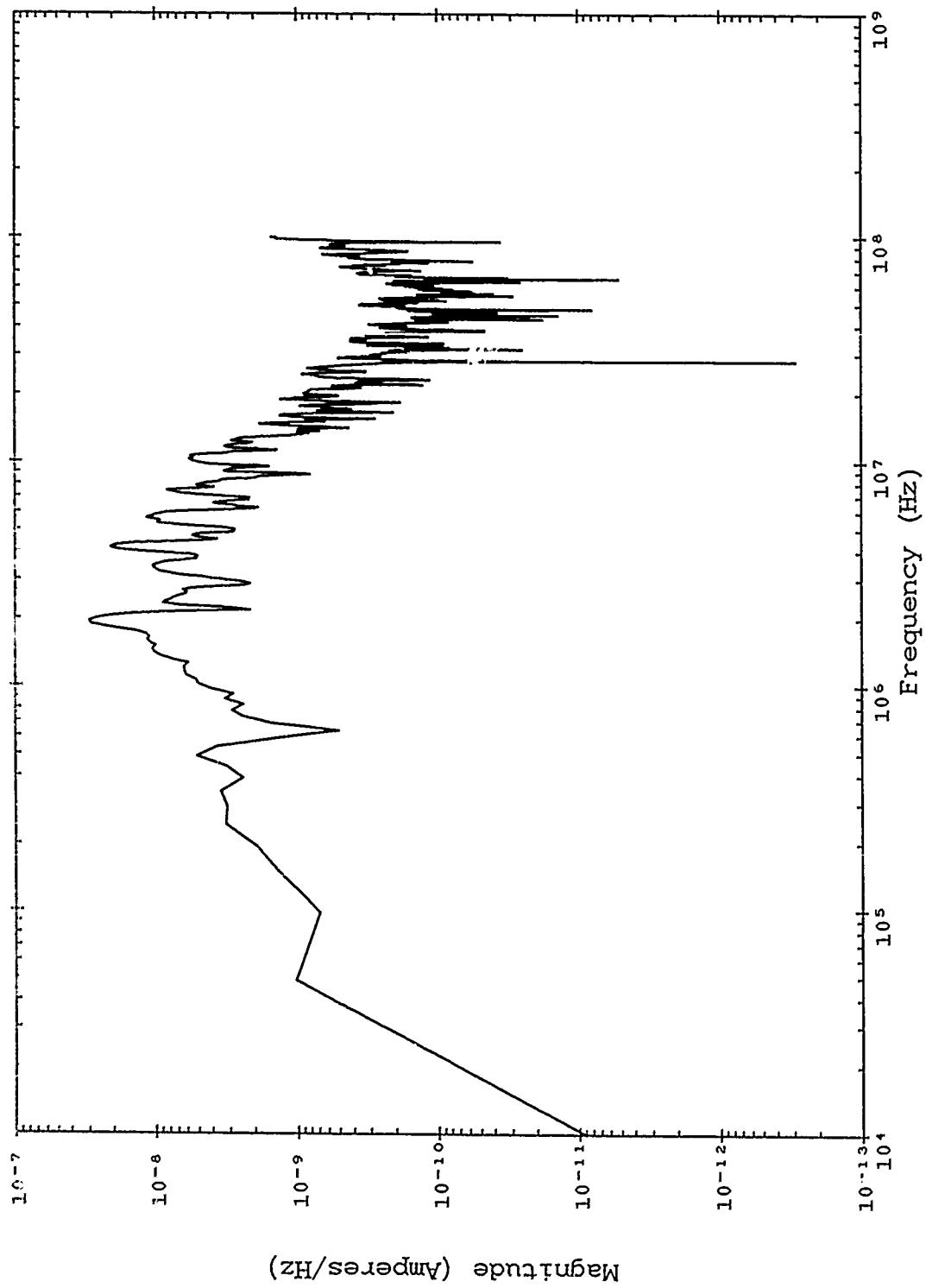


Figure B-211. Corrected TRESTLE data; TP 4859 SN 2144.

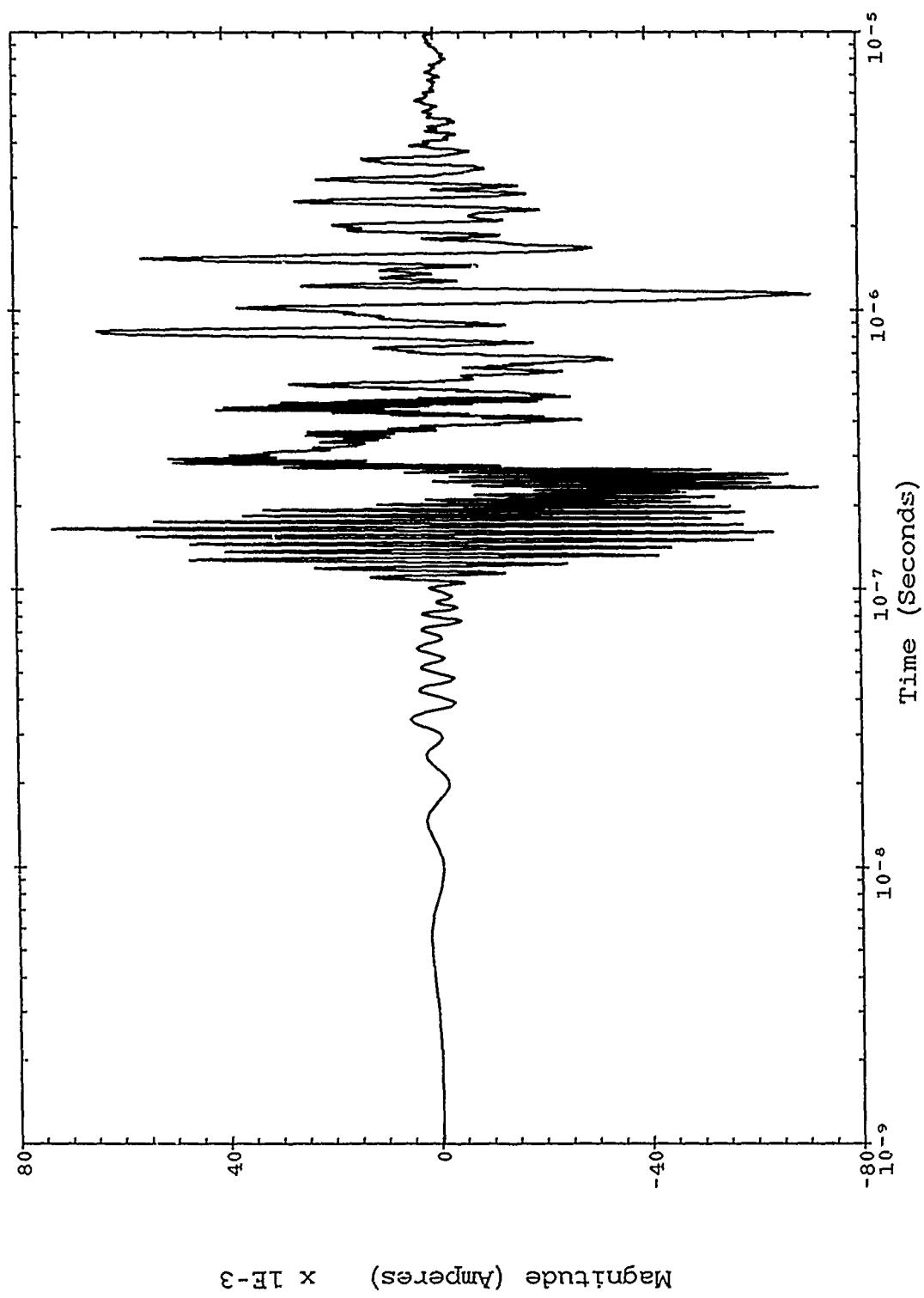


Figure B-212. Corrected TRESTLE data; RP 4859 SN 2144.

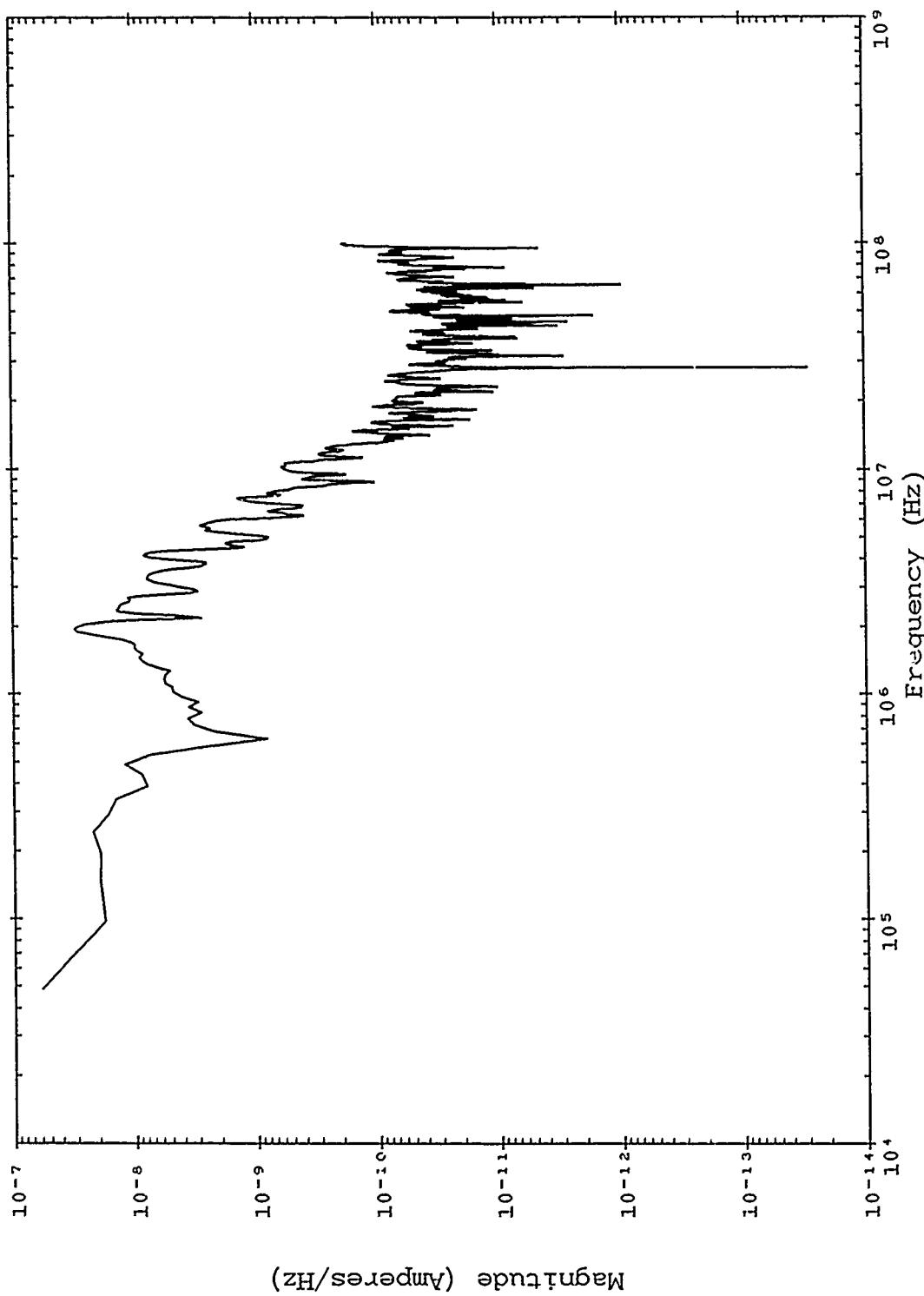


Figure B-213. Severe nearby lightning threat; TP 4859 SN 2144.

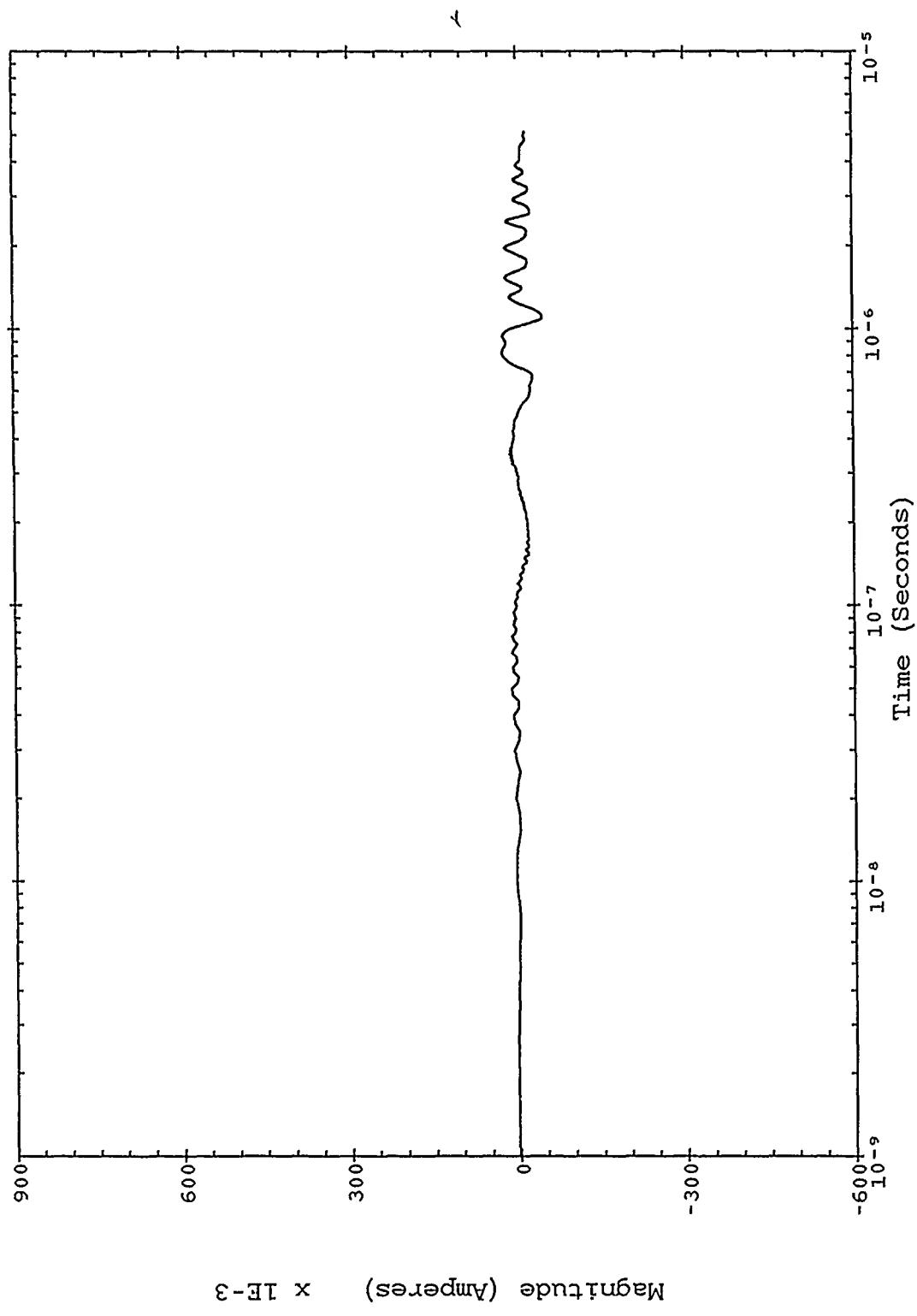


Figure B-214. Severe nearby lightning threat; TP 4859 SN 2144.

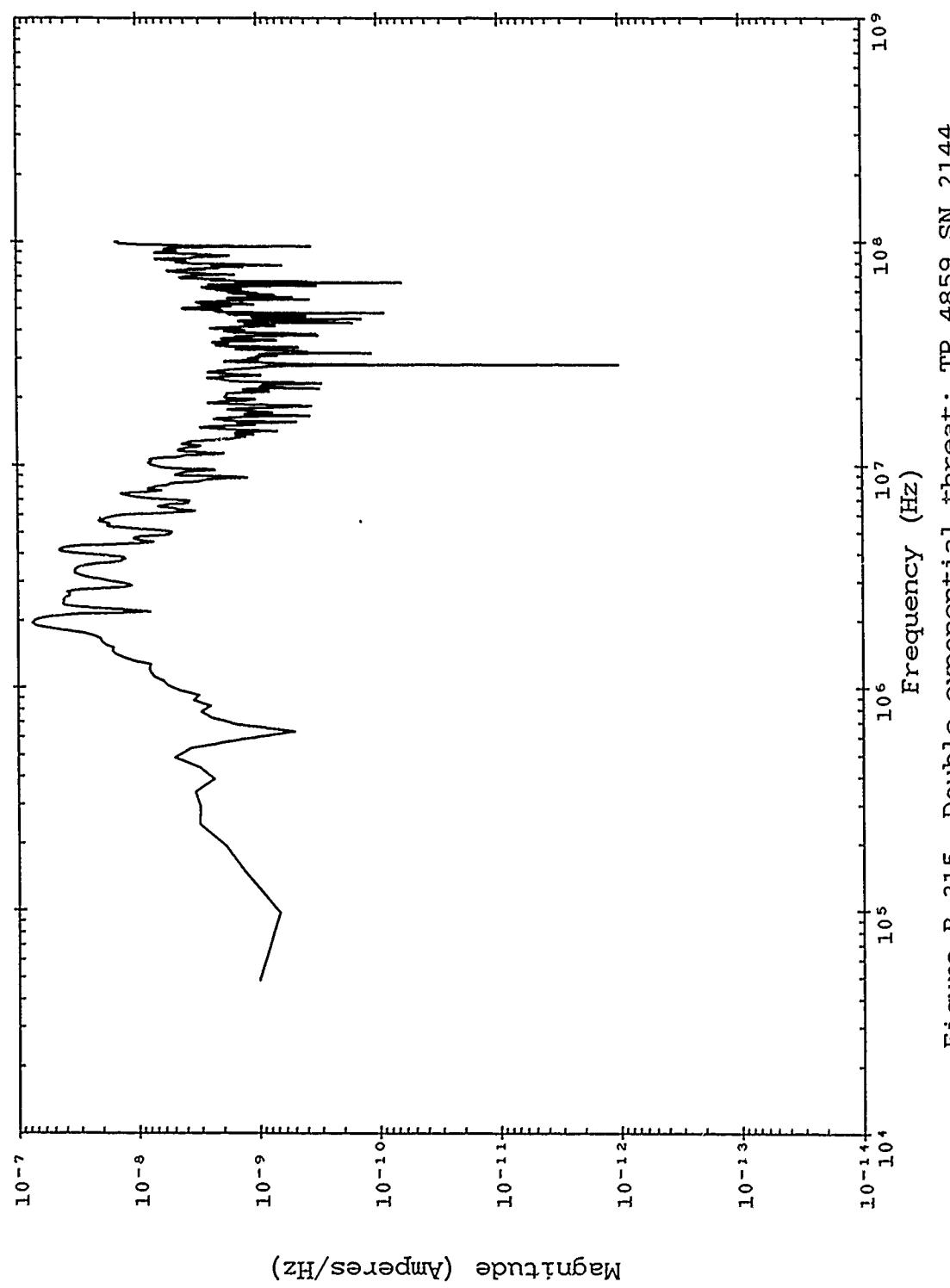


Figure B-215. Double exponential threat; TP 4859 SN 2144.

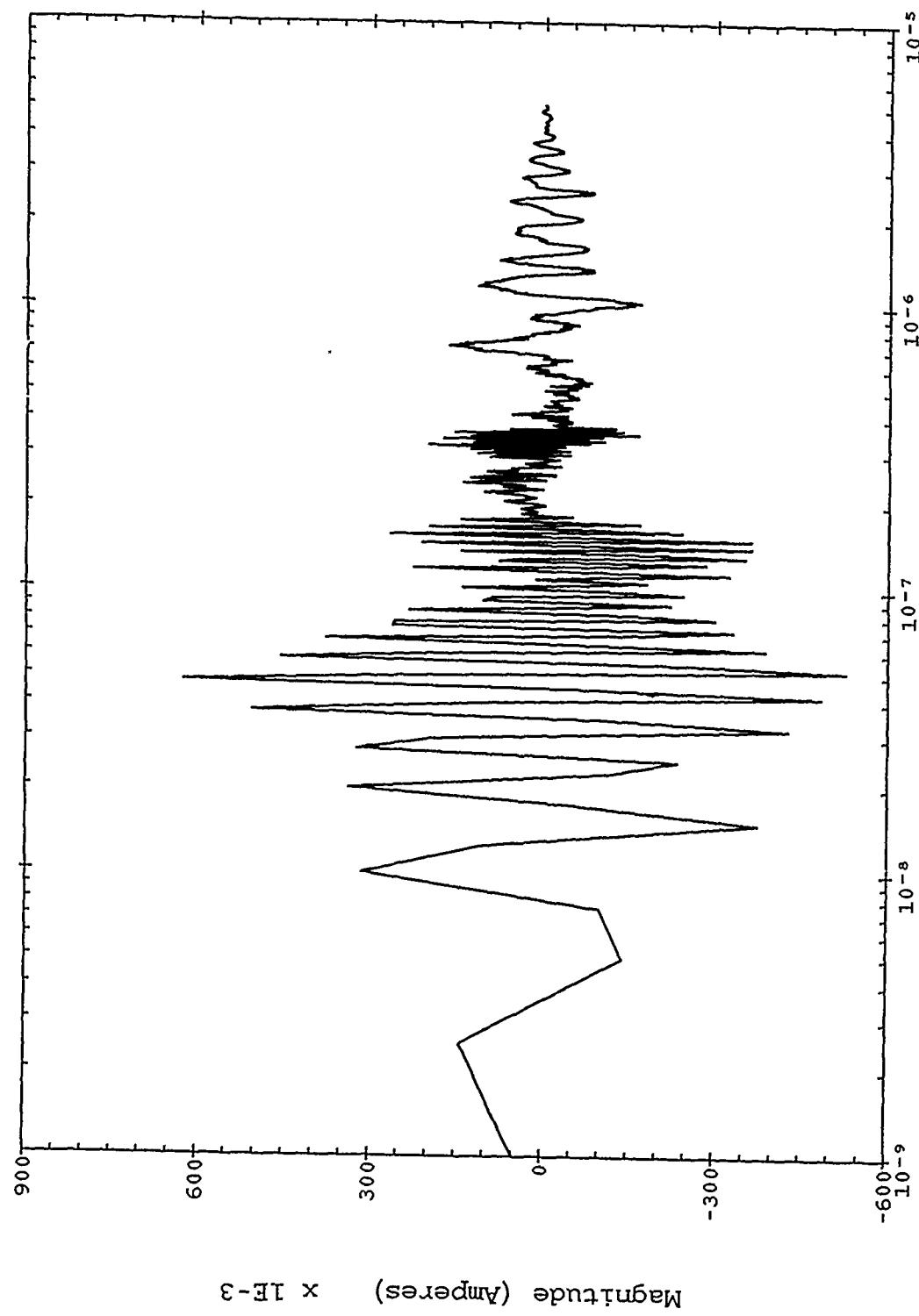


Figure B-216. Double exponential threat; TP 4859 SN 2144.

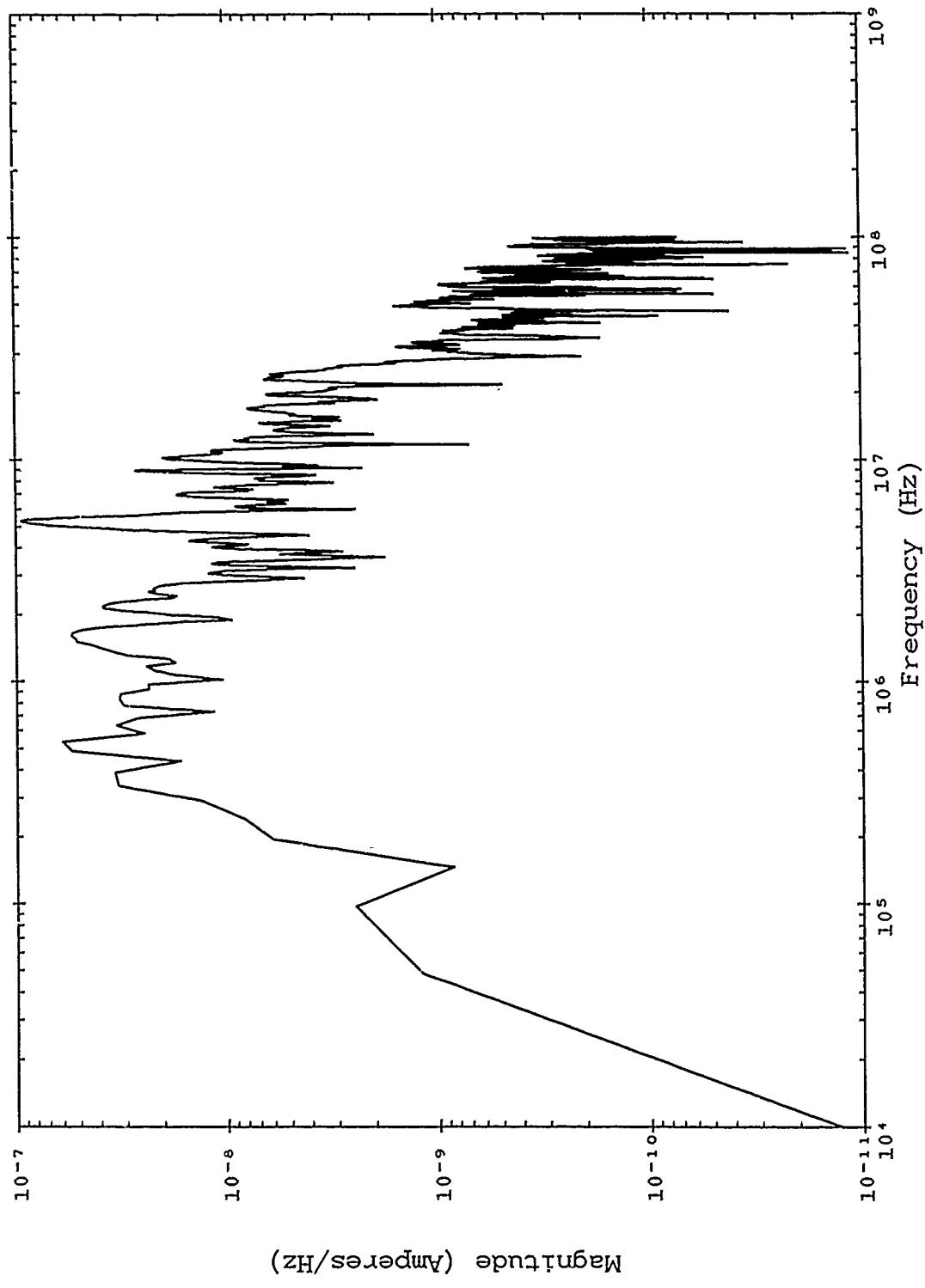


Figure B-217. Corrected TRESTLE data; TP 4914 SN 2217.

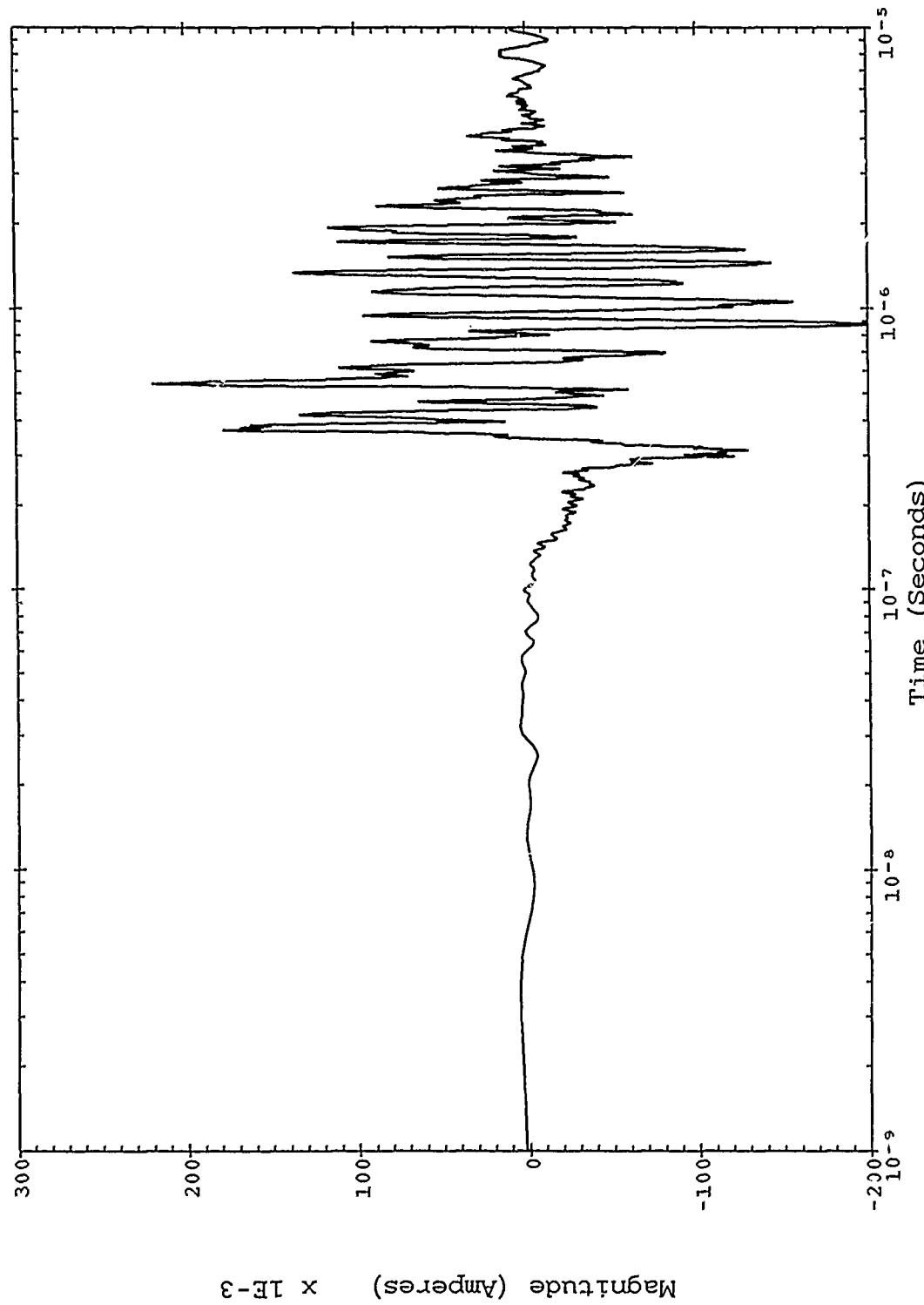


Figure B-218. Corrected TRESTLE data; TP 4914 SN 2217.

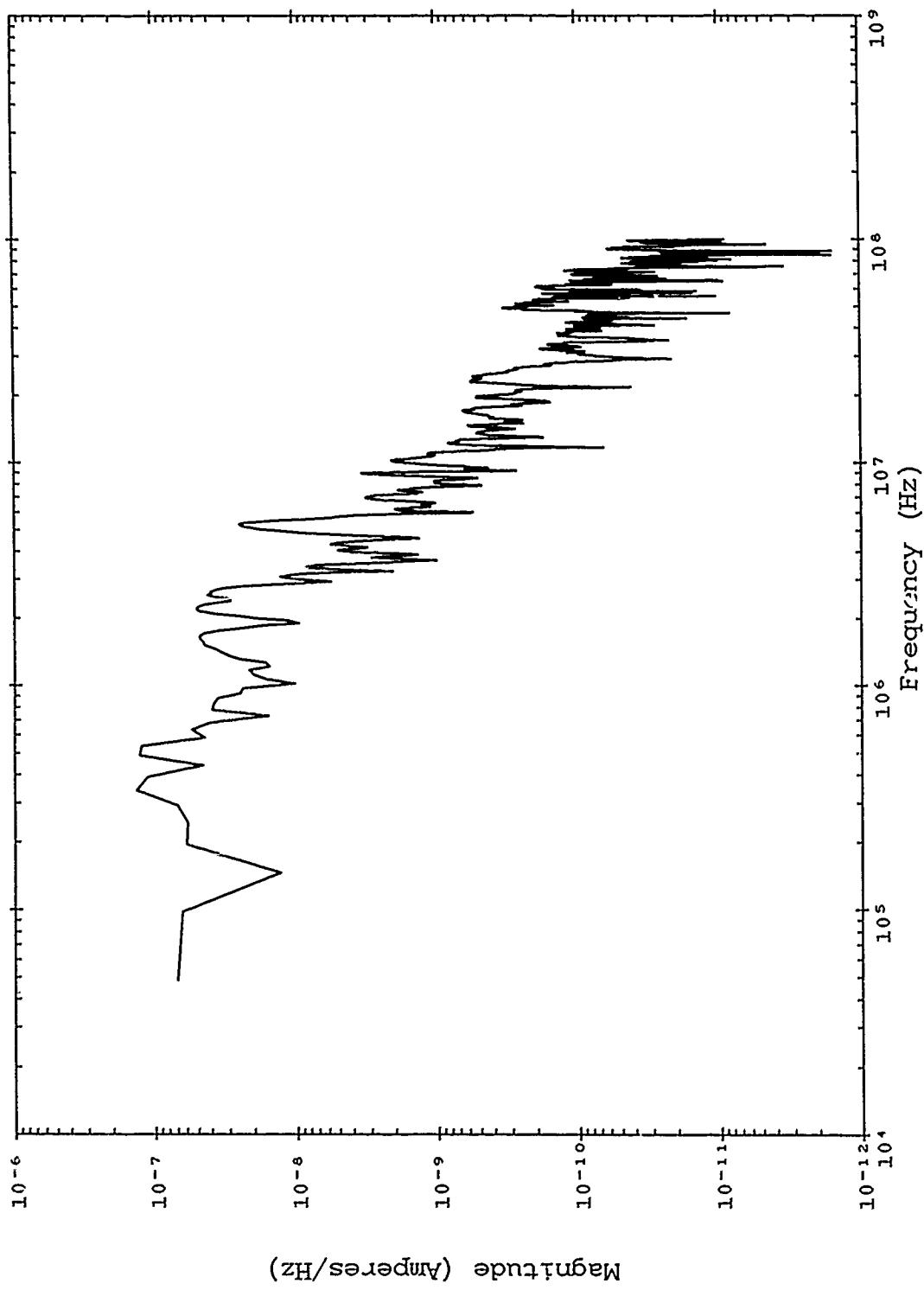


Figure B-219. Severe nearby lightning threat; TP 4914 SN 2217.

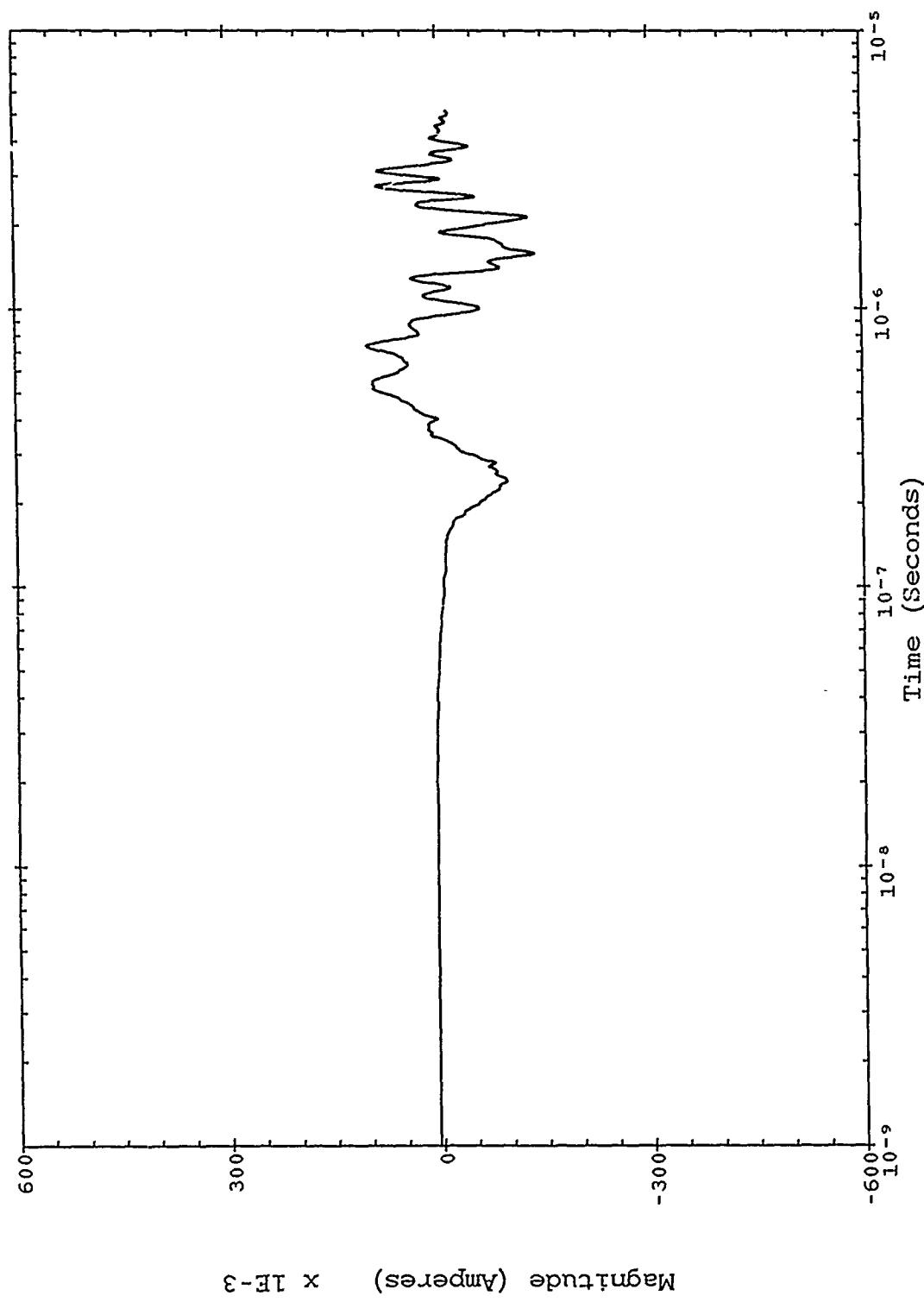


Figure B-220. Severe nearby lightning threat; TP 4914 SN 2217.

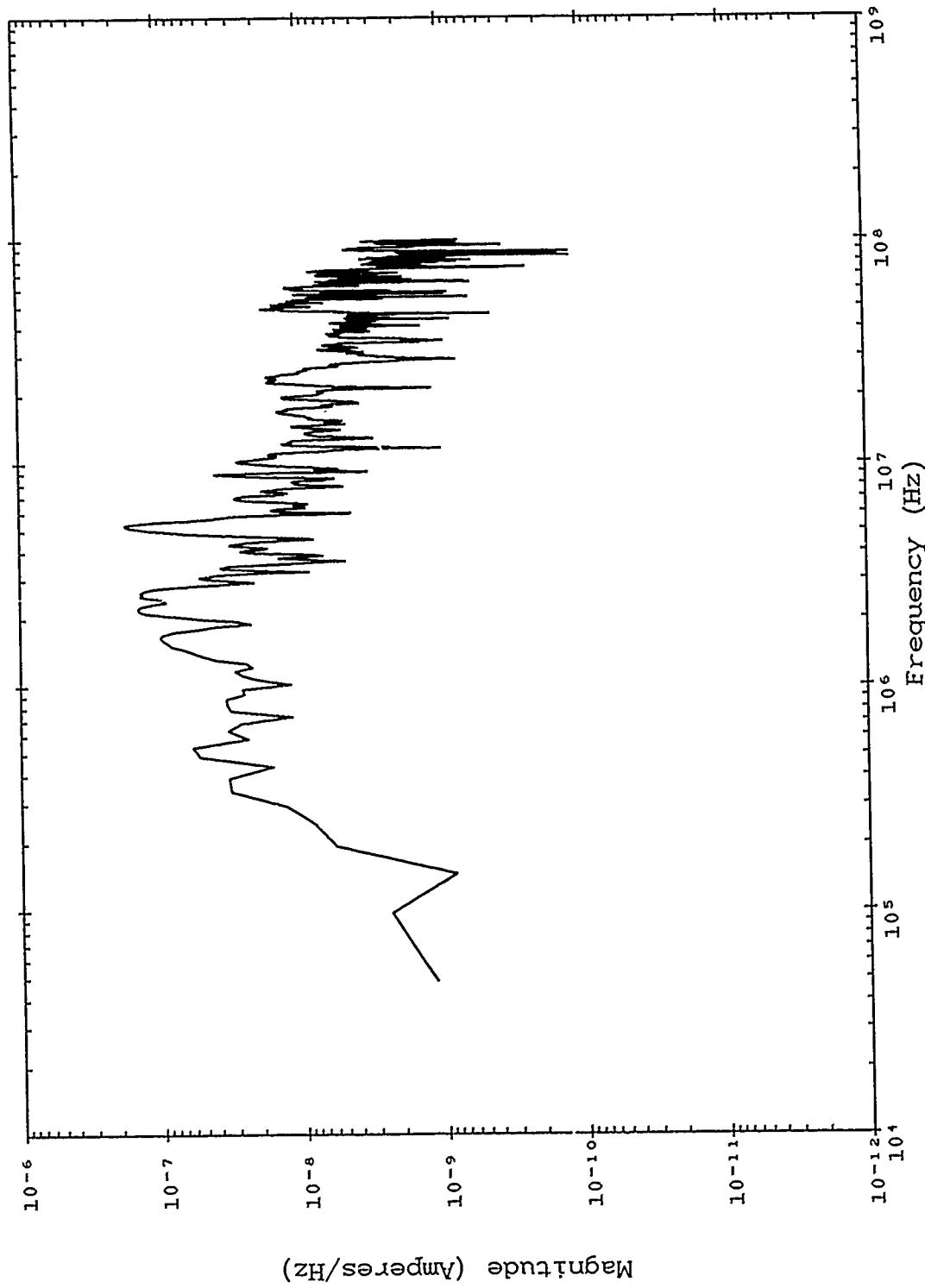


Figure B-221. Double exponential threat; TP 4914 SN 2217.

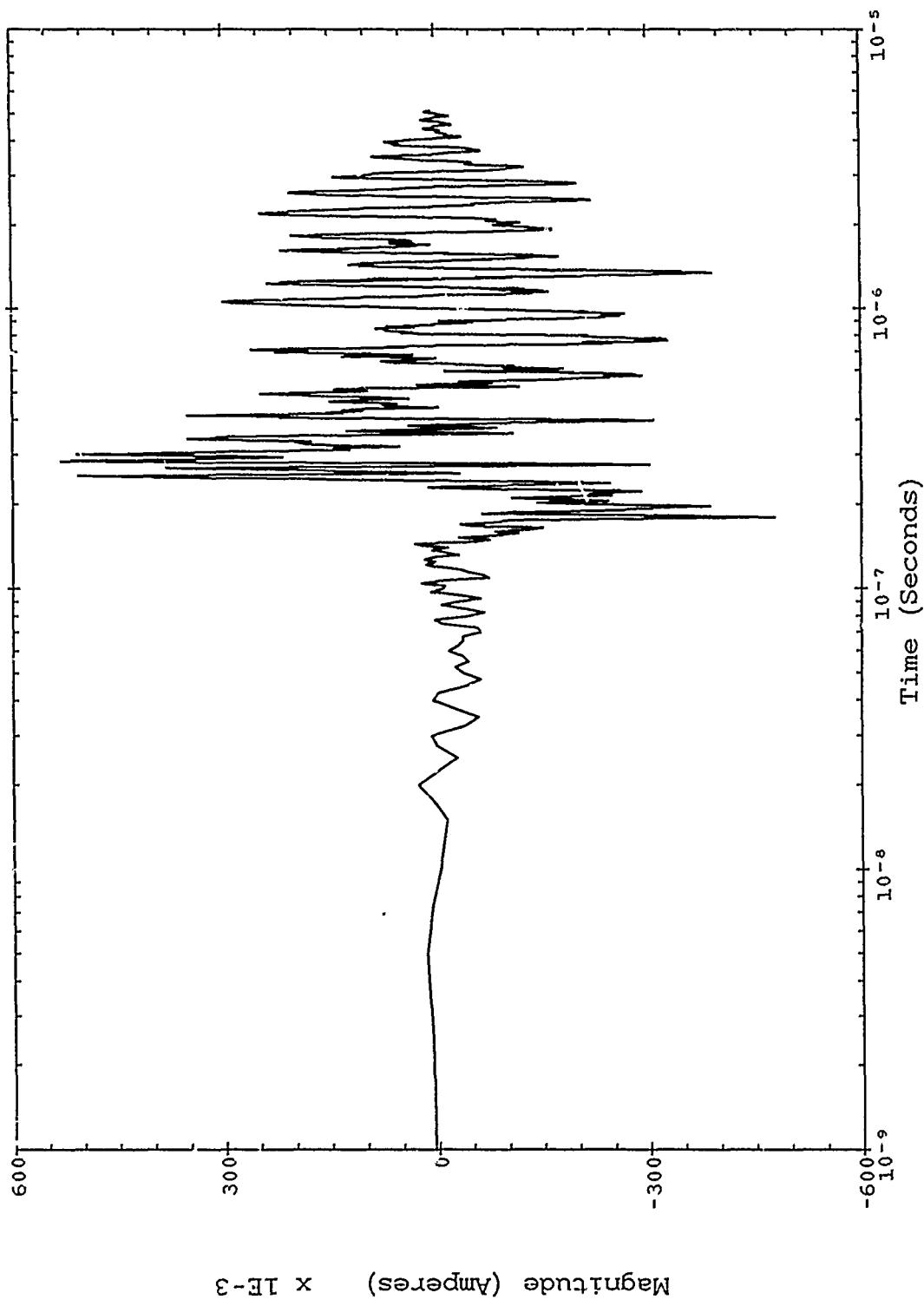


Figure B-222. Double exponential threat; TR 4914 SN 2217.

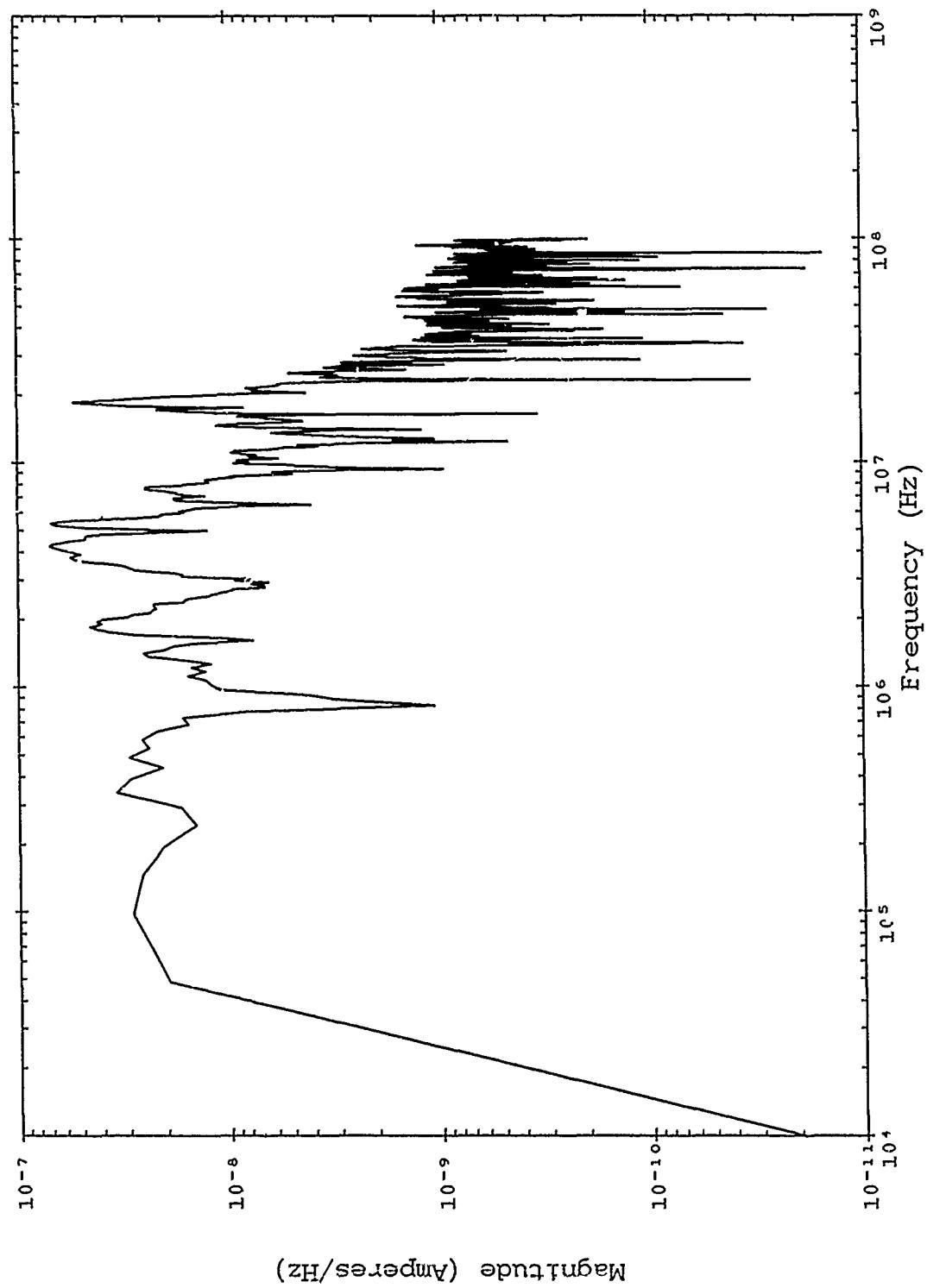


Figure B-223. Corrected TRESTLE data; TP 4924 SN 2645.

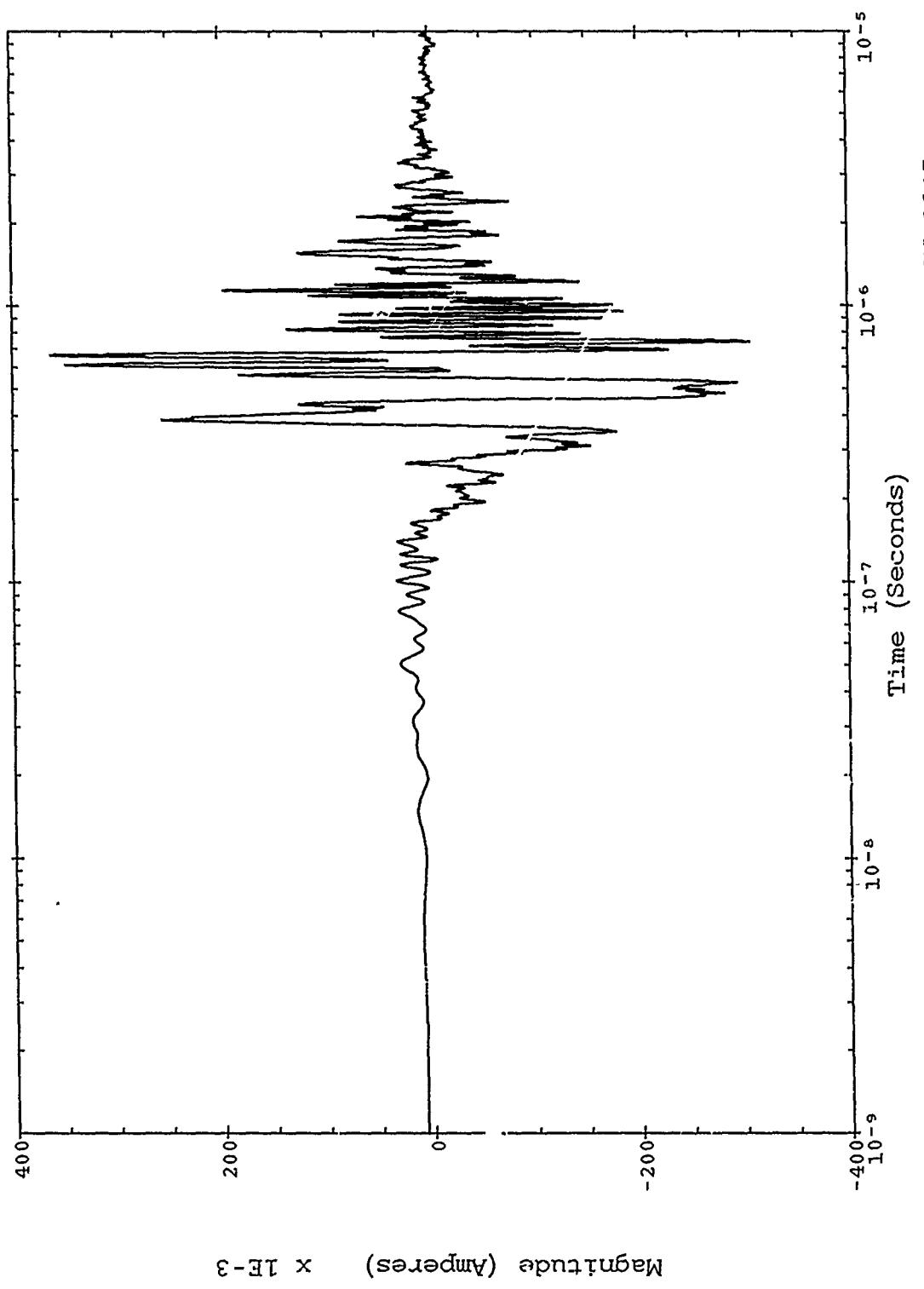


Figure B-224. Corrected TRESTLE data; TP 4924 SN 2645.

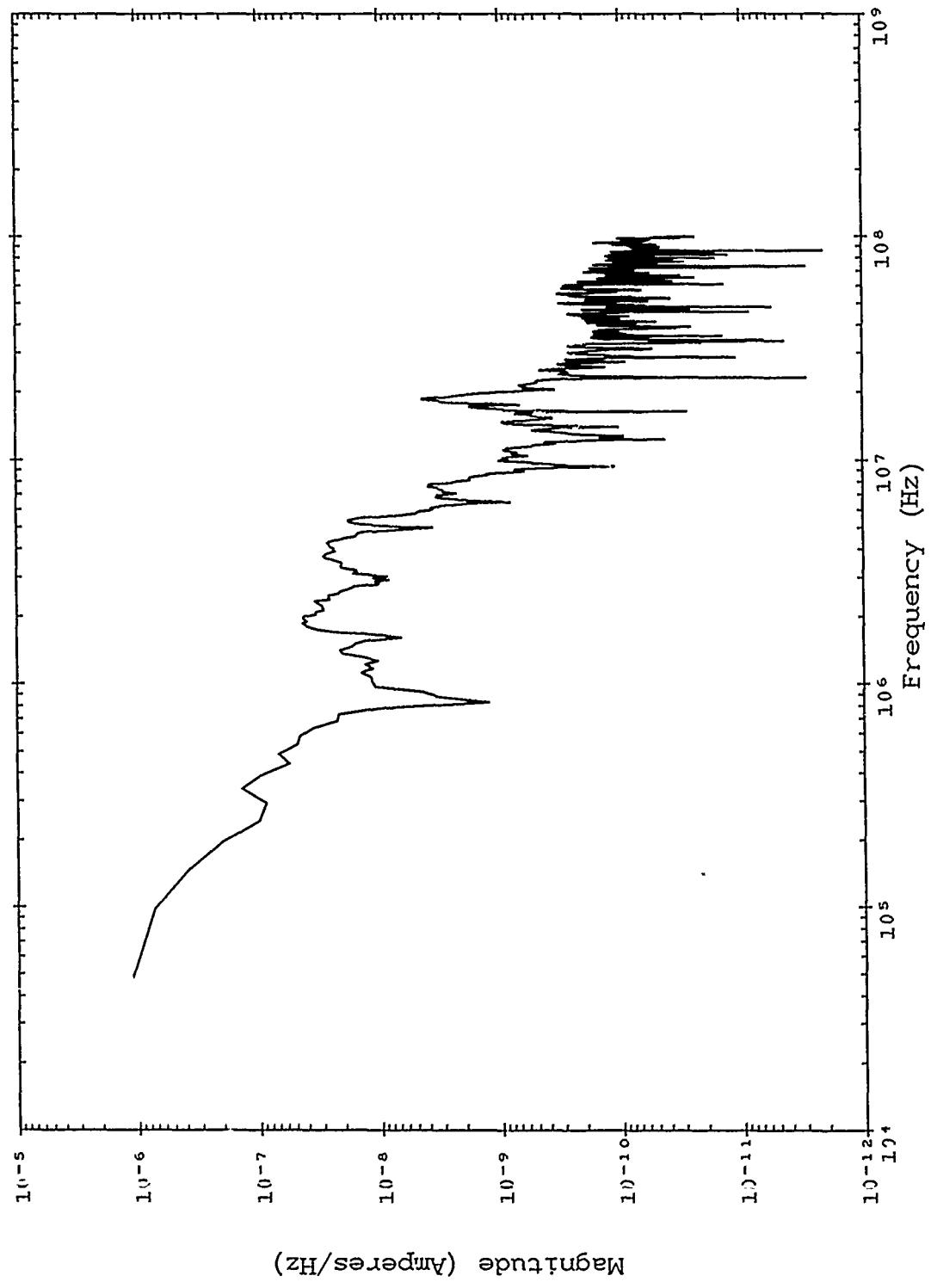


Figure B-225. Severe nearby lightning threat; TP 4924 SN 2645.

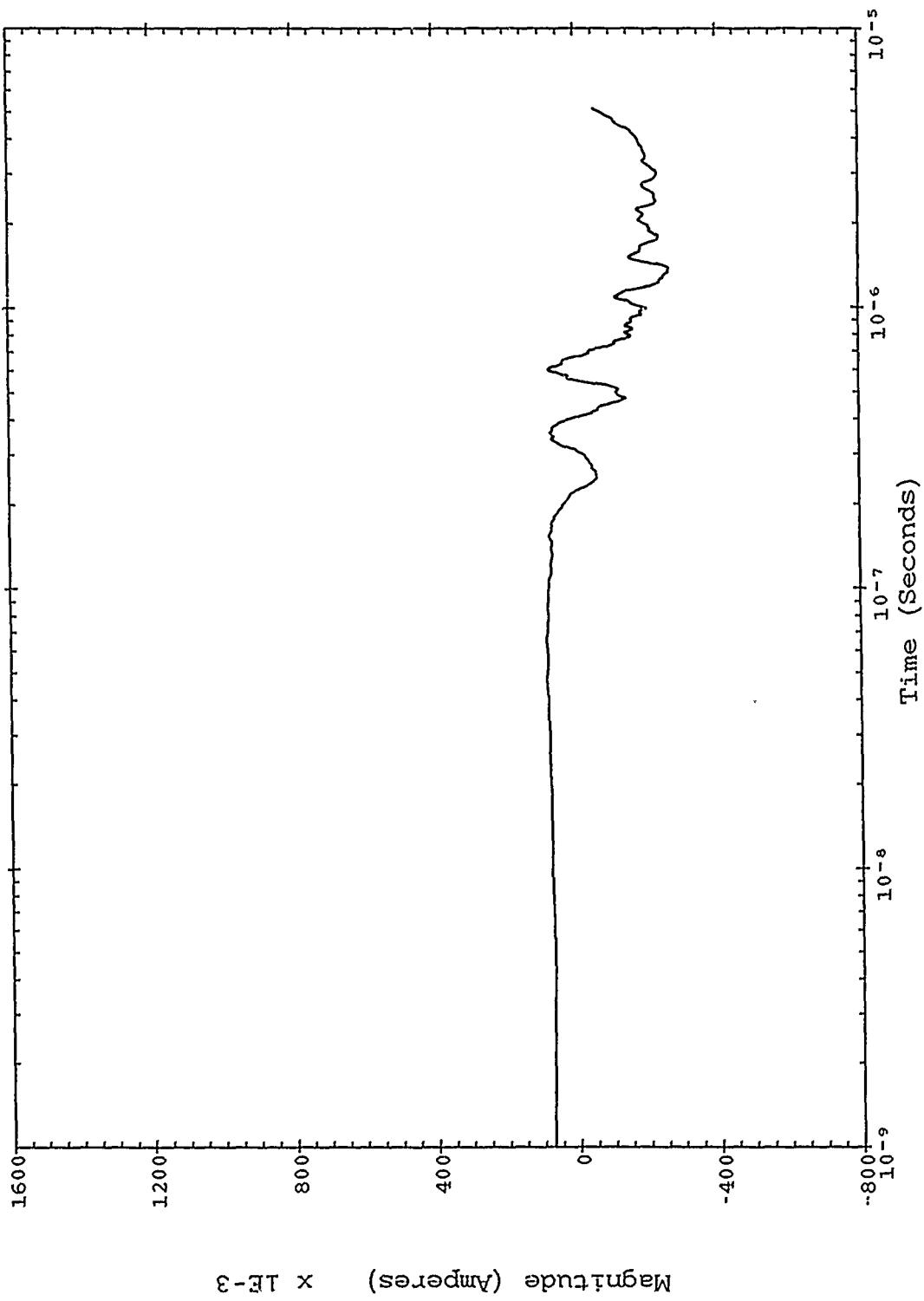


Figure B-226. Severe nearby lightning threat; TP 4924 SN 2645.

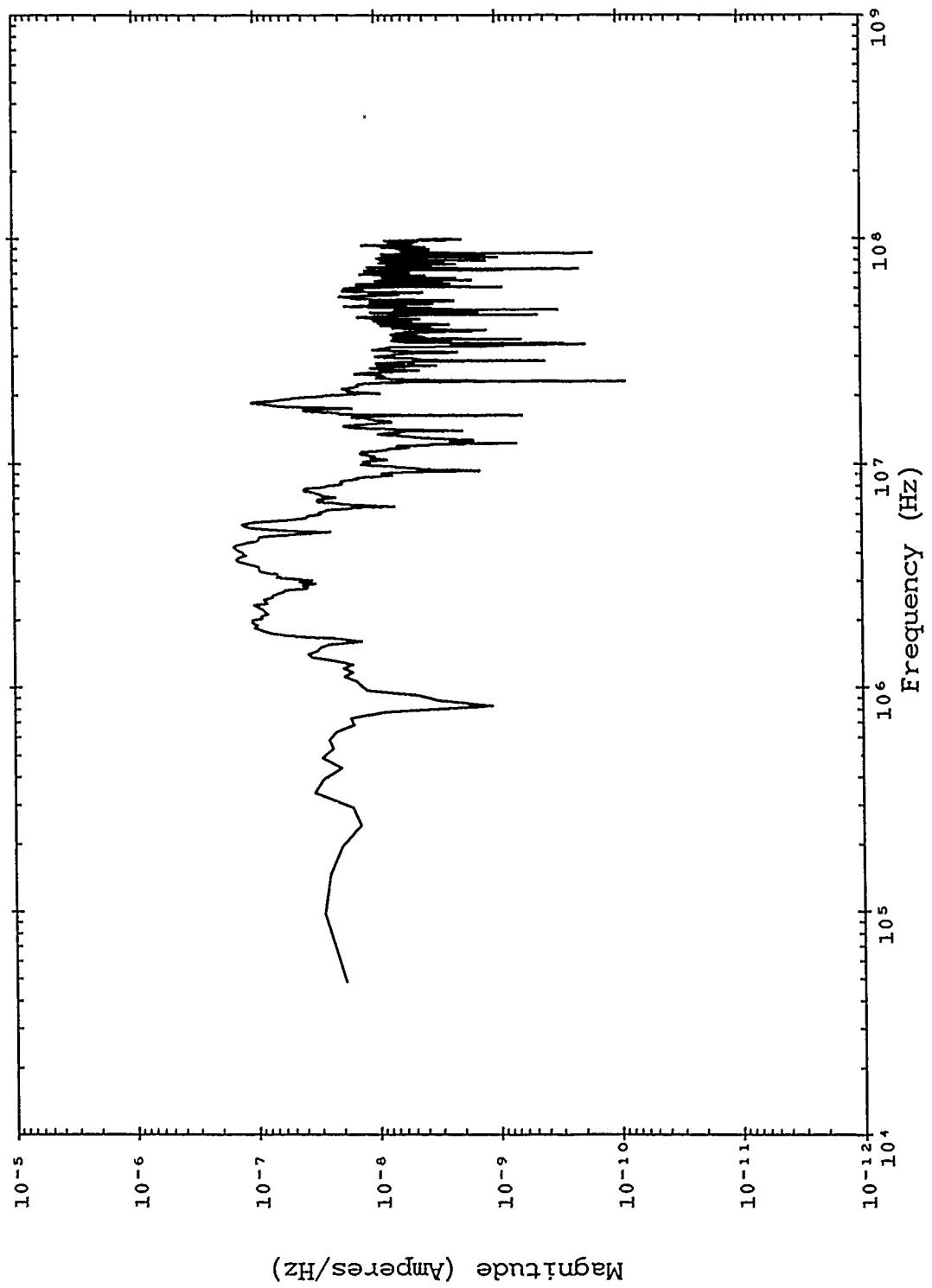


Figure B-227. Double exponential threat; TP 4924 SN 2645.

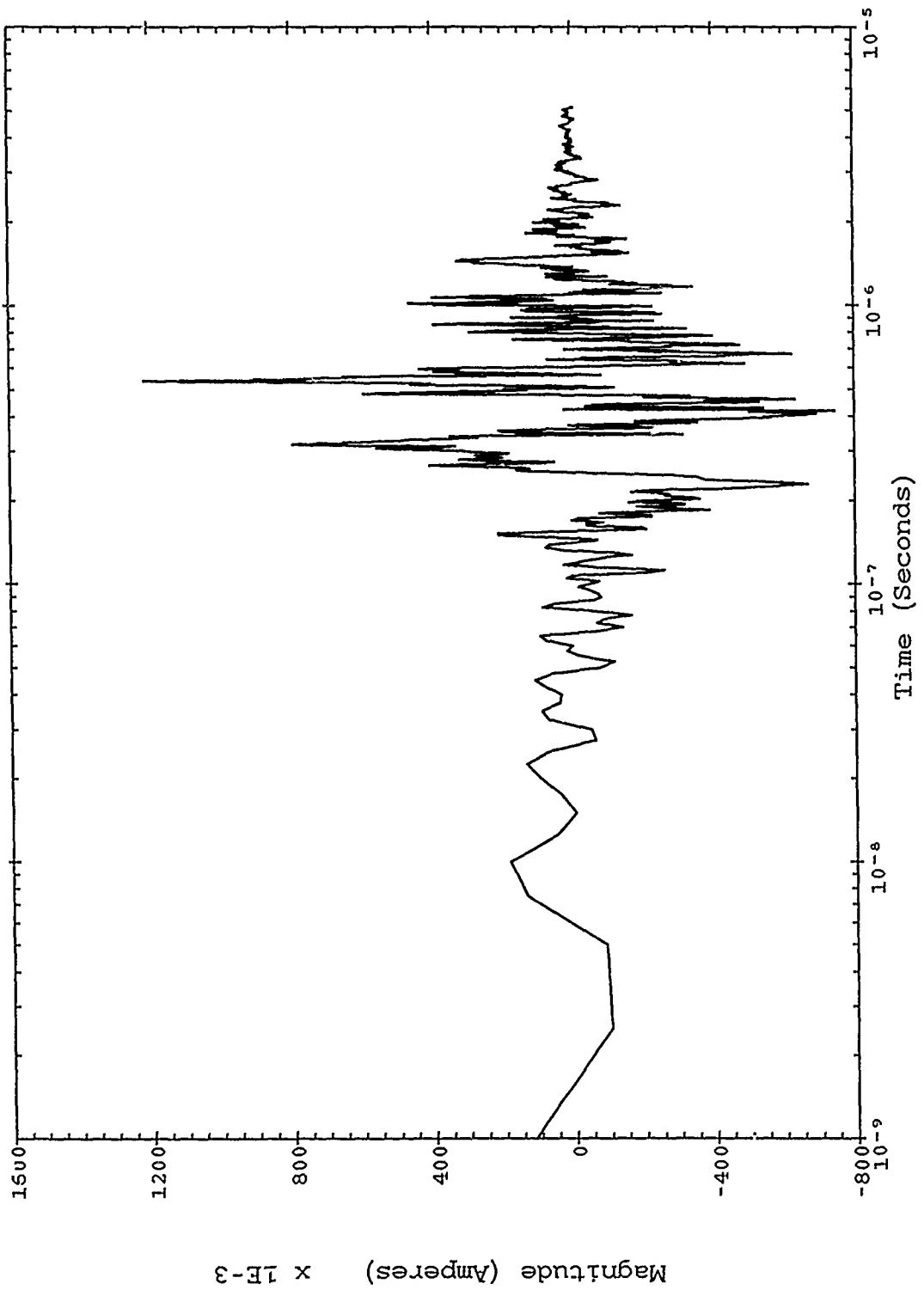


Figure B-228. Double exponential threat; TP 4924 SN 2645.

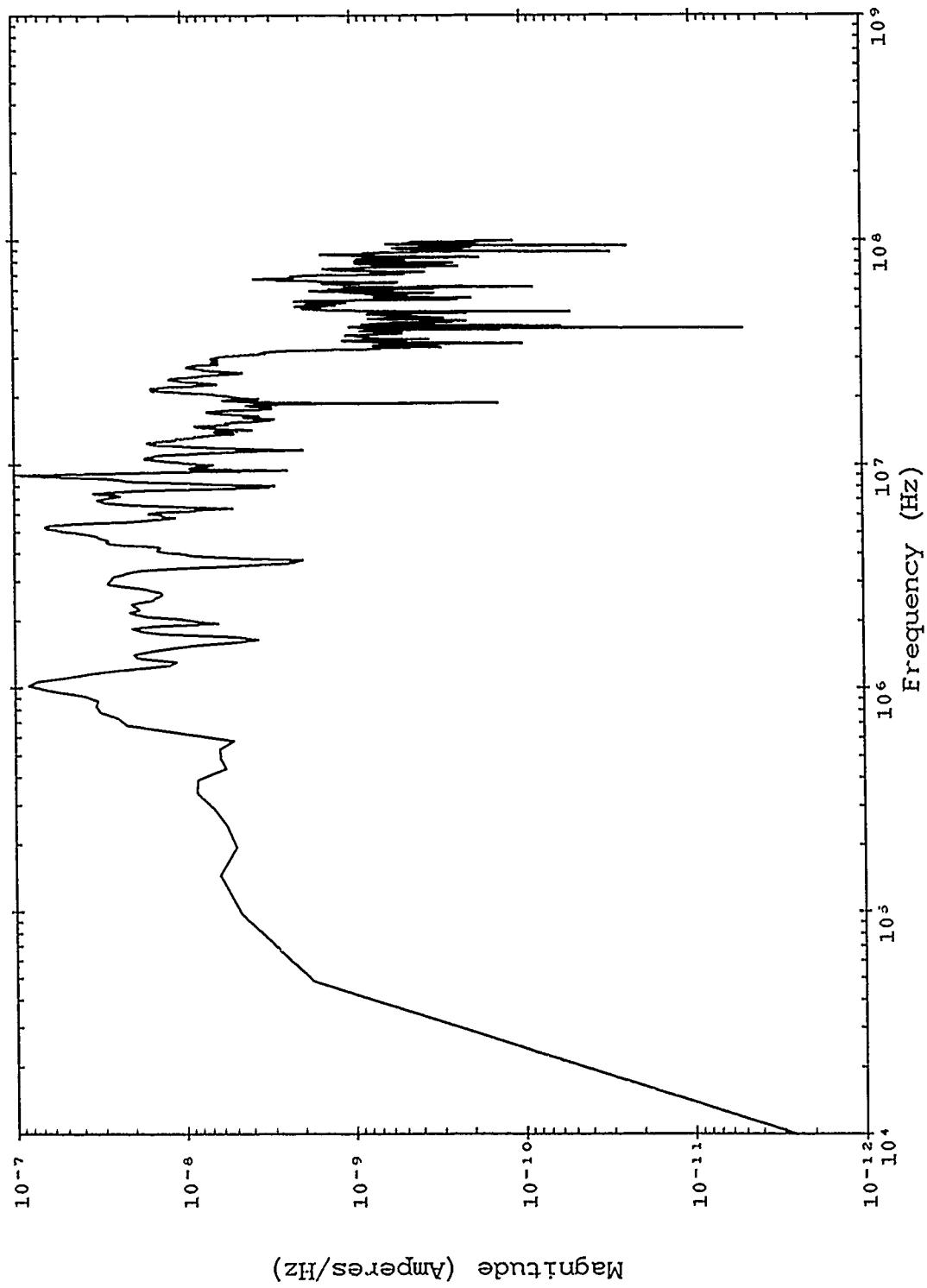


Figure B-229. Corrected TRESTLE data; TP 5169 SN 2588.

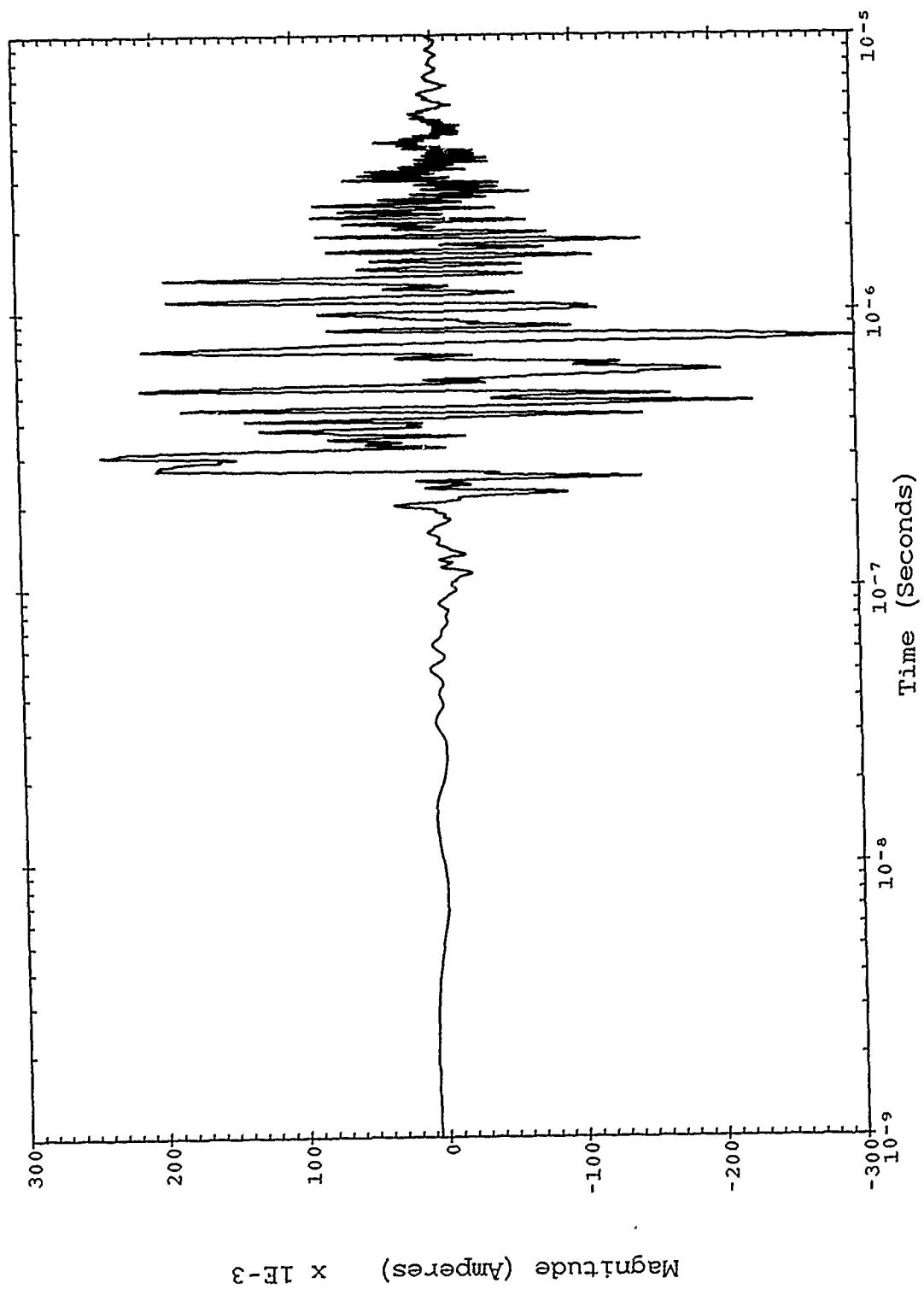


Figure B-230. Corrected TRESTLE data; TP 5169 SN 2588.

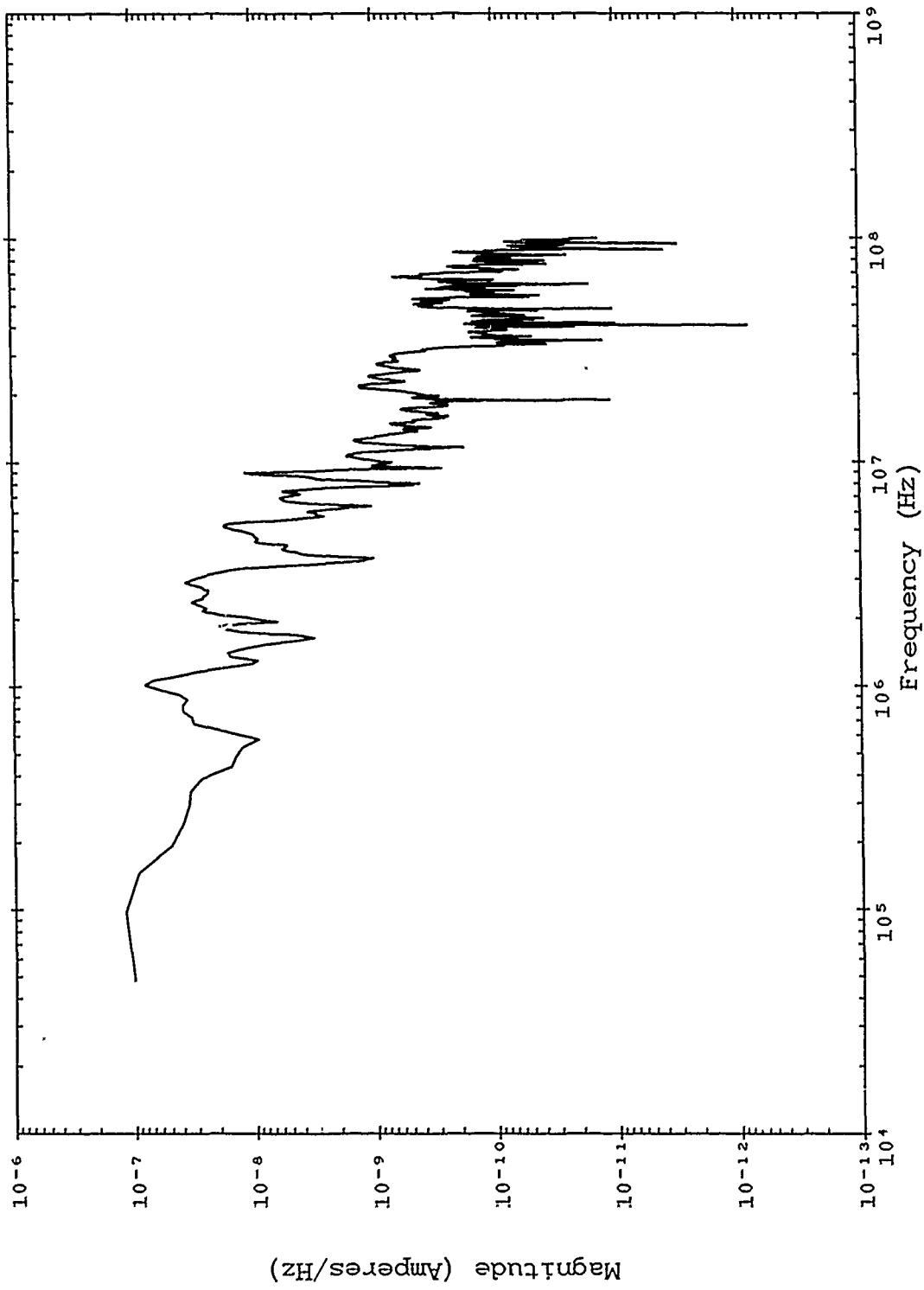


Figure B-231. Severe nearby lightning threat; TP 5169 SN 2588.

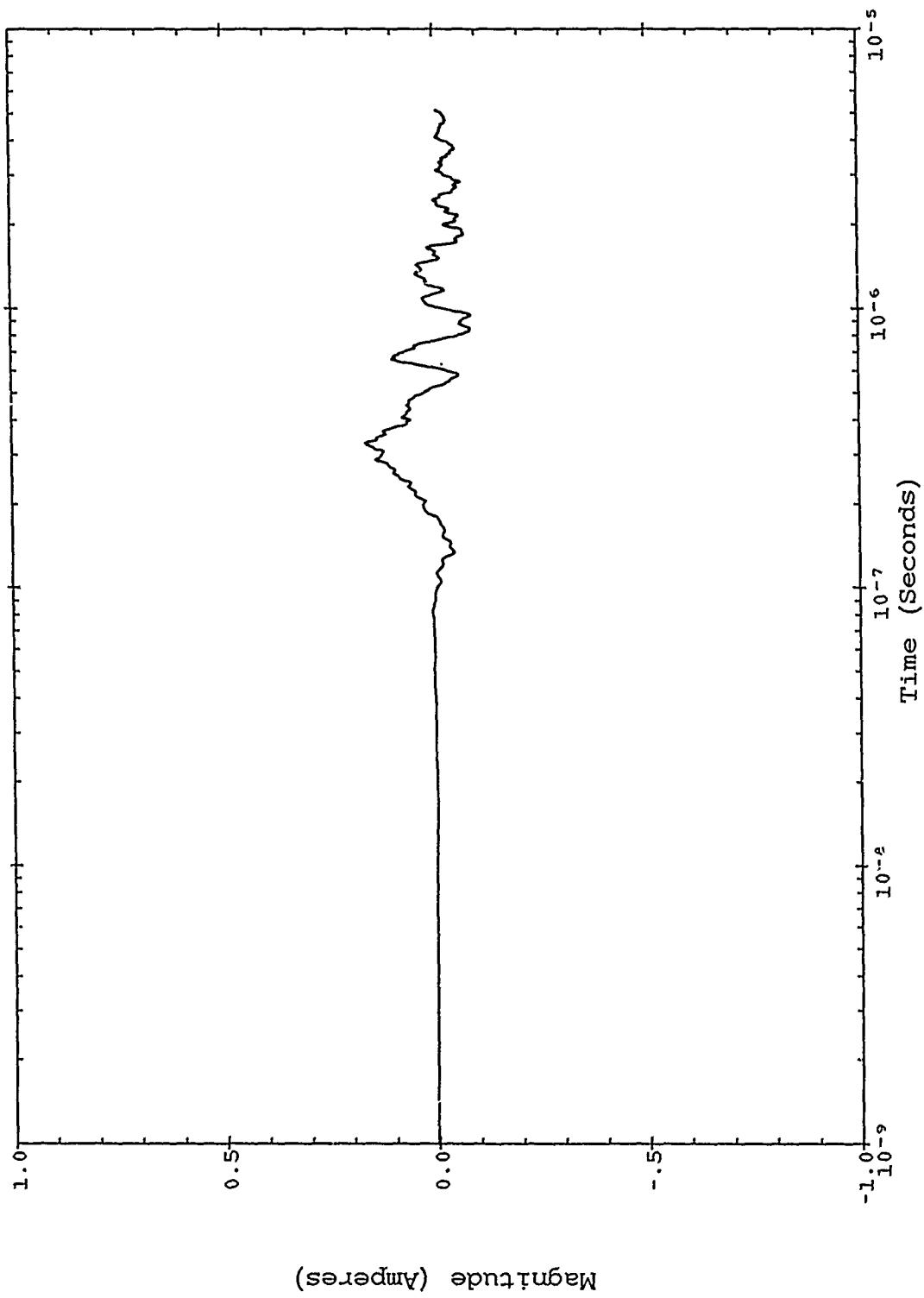


Figure B-232. Severe nearby lightning threat; TP 5169 SN 2588.

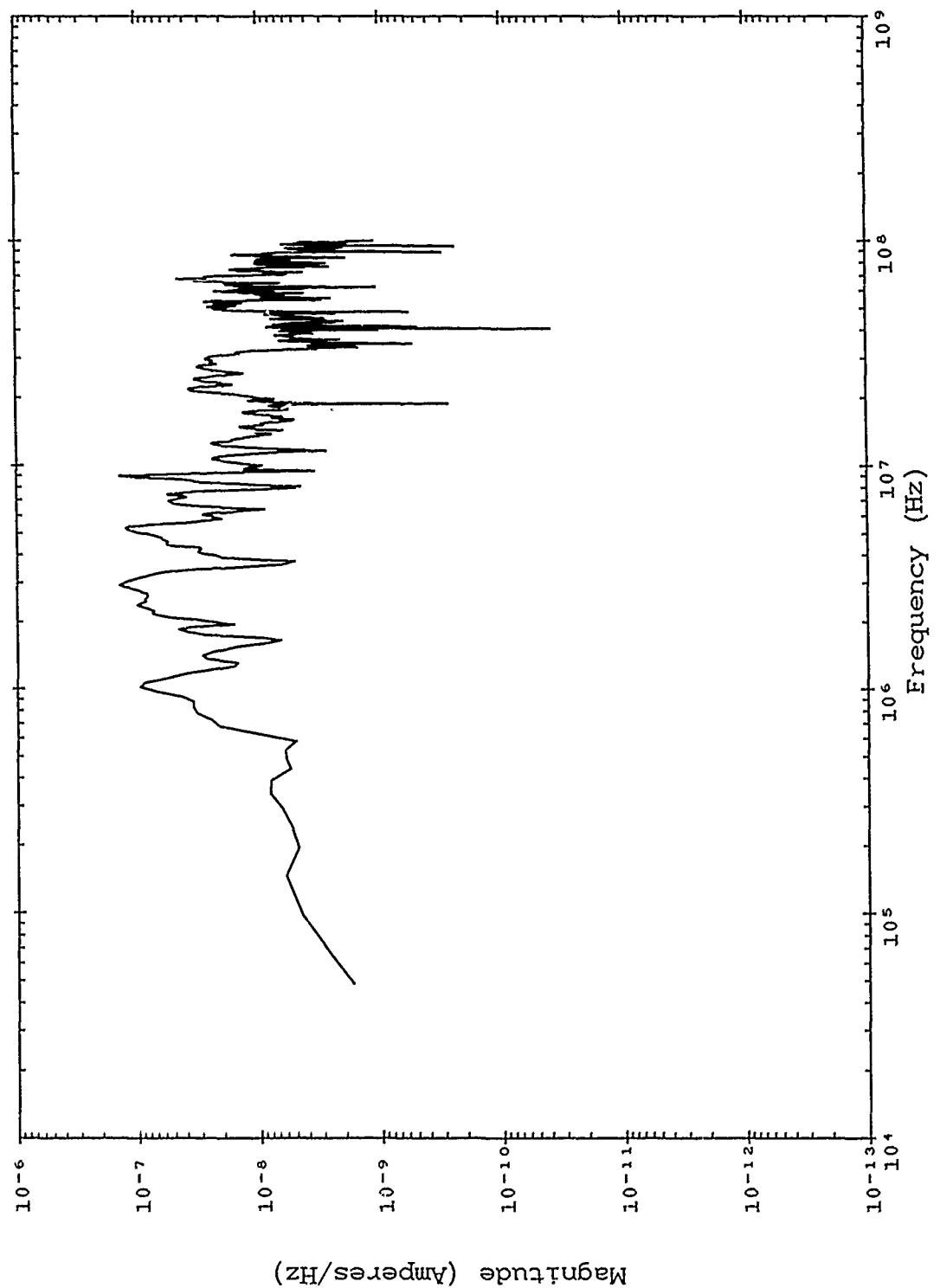


Figure B-233. Double exponential threat; TP 5169 SN 2588.

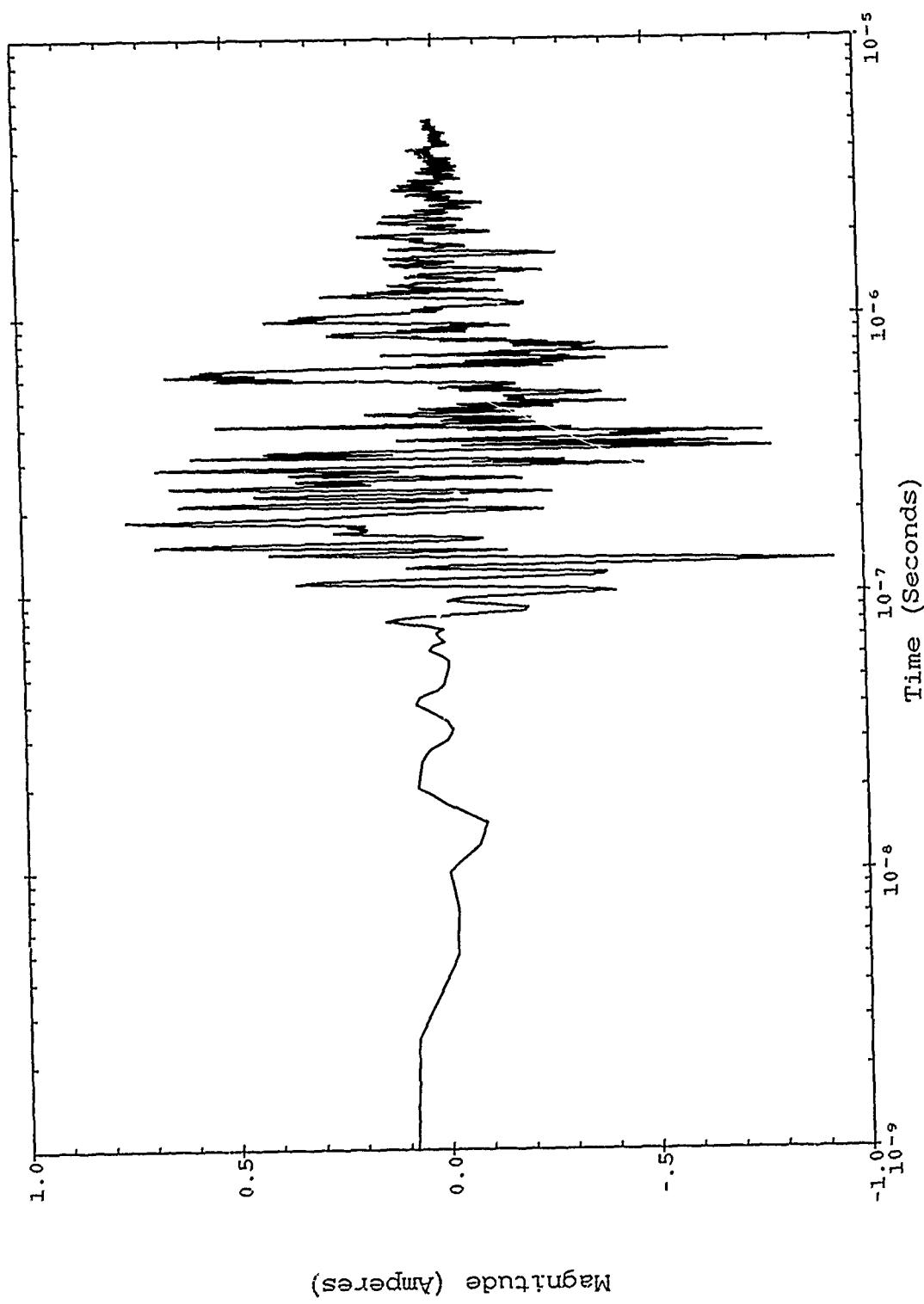


Figure B-234. Double exponential threat; TP 5169 SN 2588.

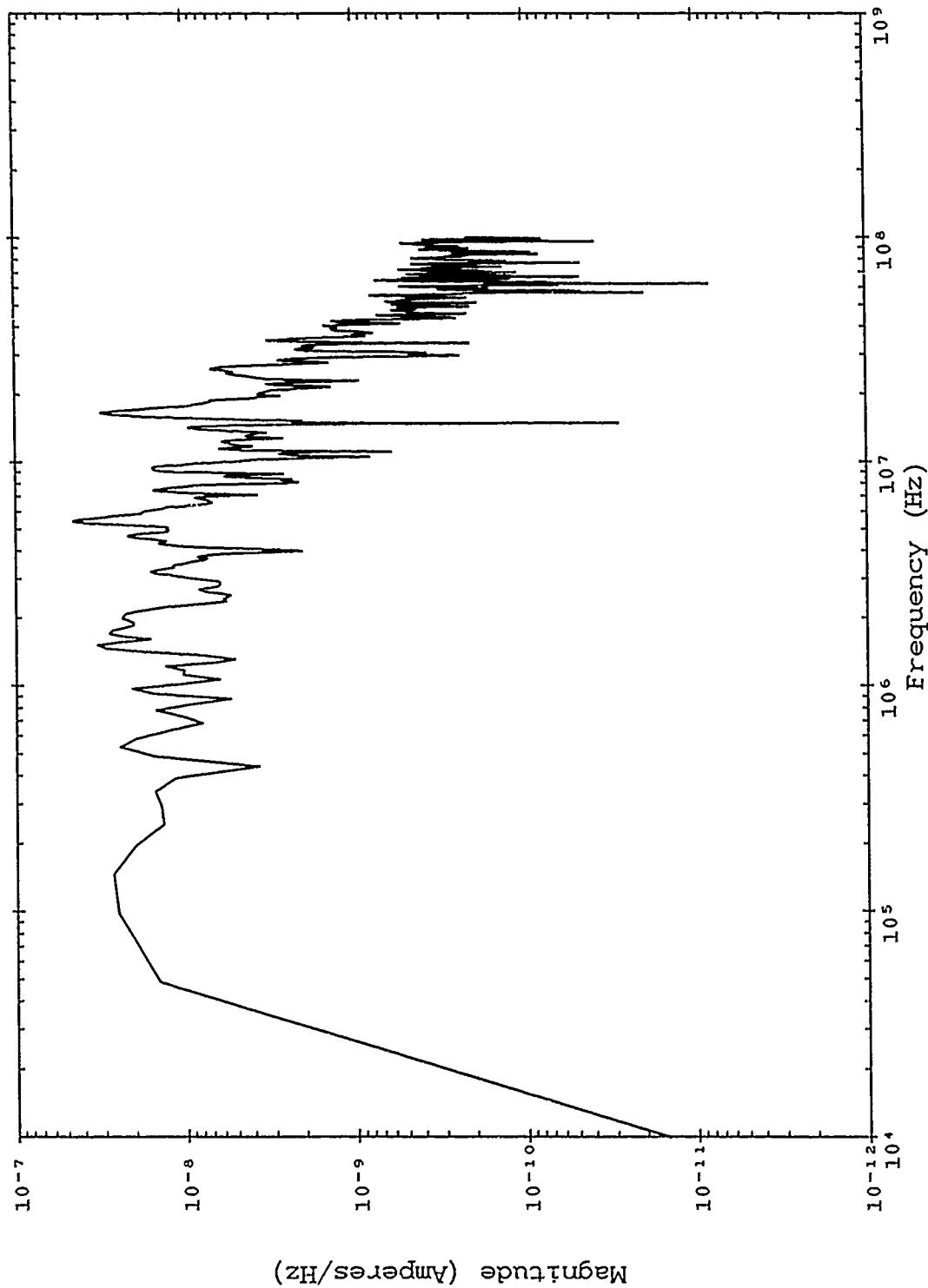


Figure B-235. Corrected TRESTLE data; TP 5283 SN 1717.

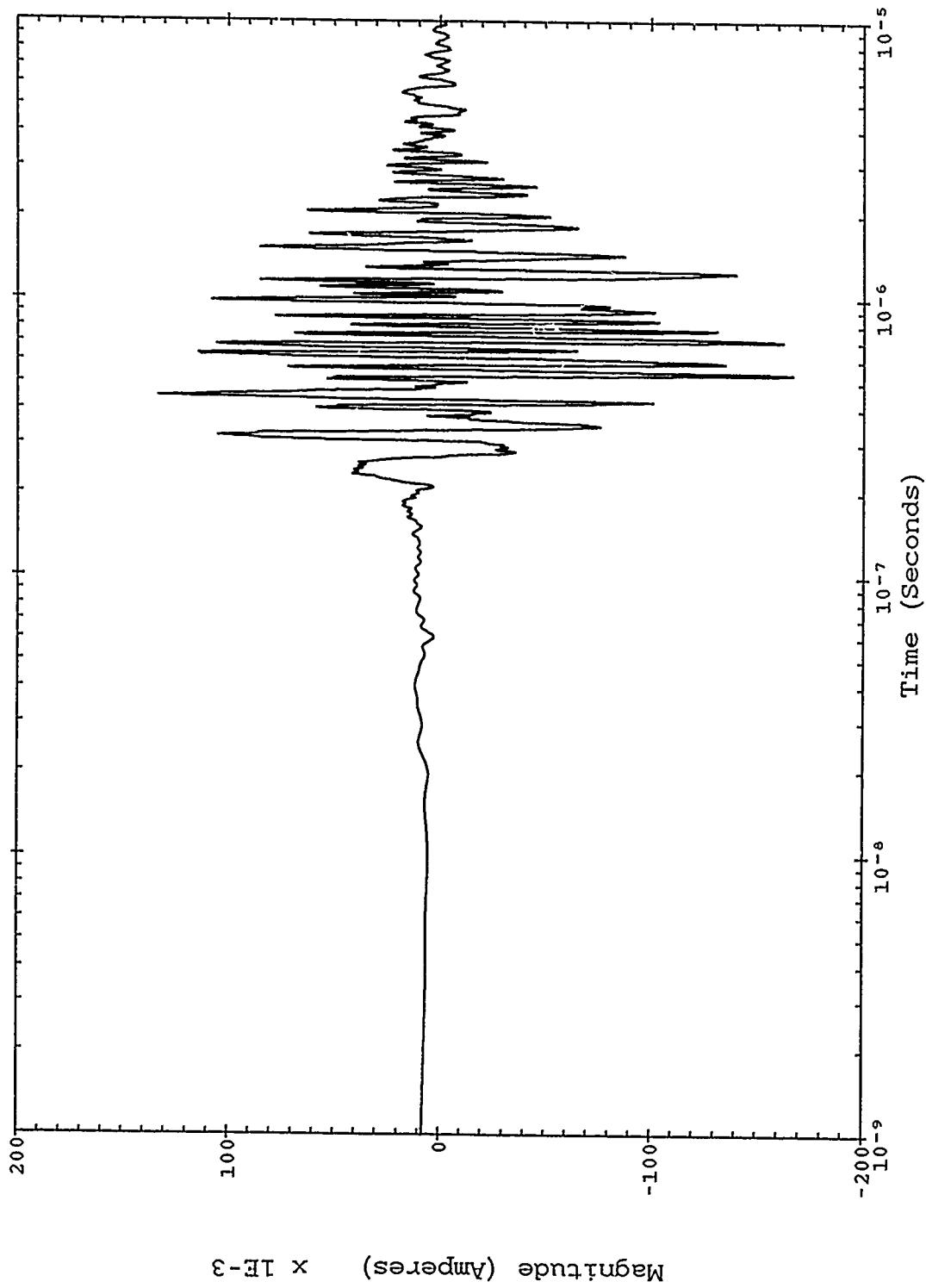


Figure B-236. Corrected TRESTLE data; TP 5283 SN 1717.

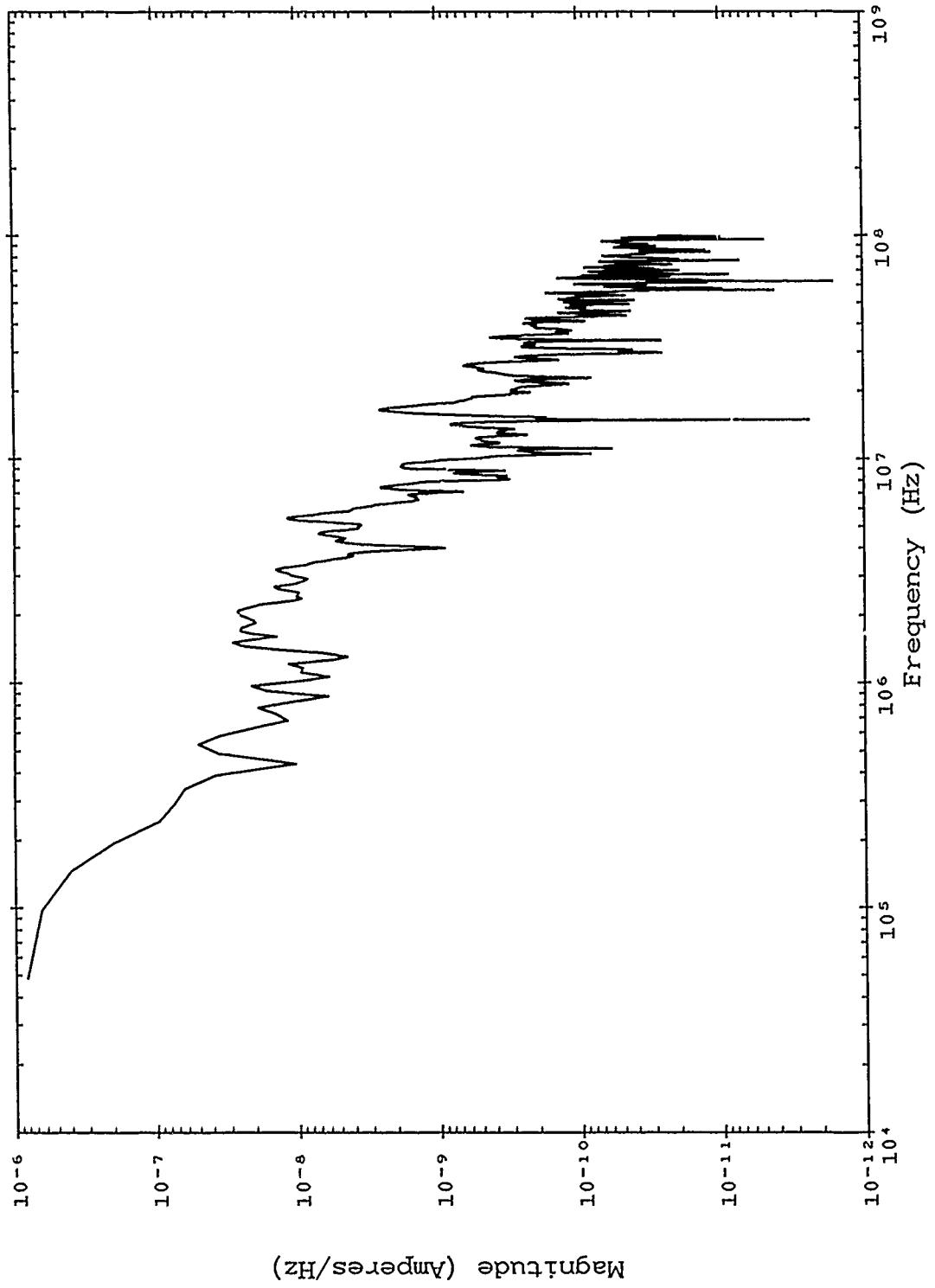


Figure B-237. Severe nearby lightning threat; TP 5283 SN 1717.

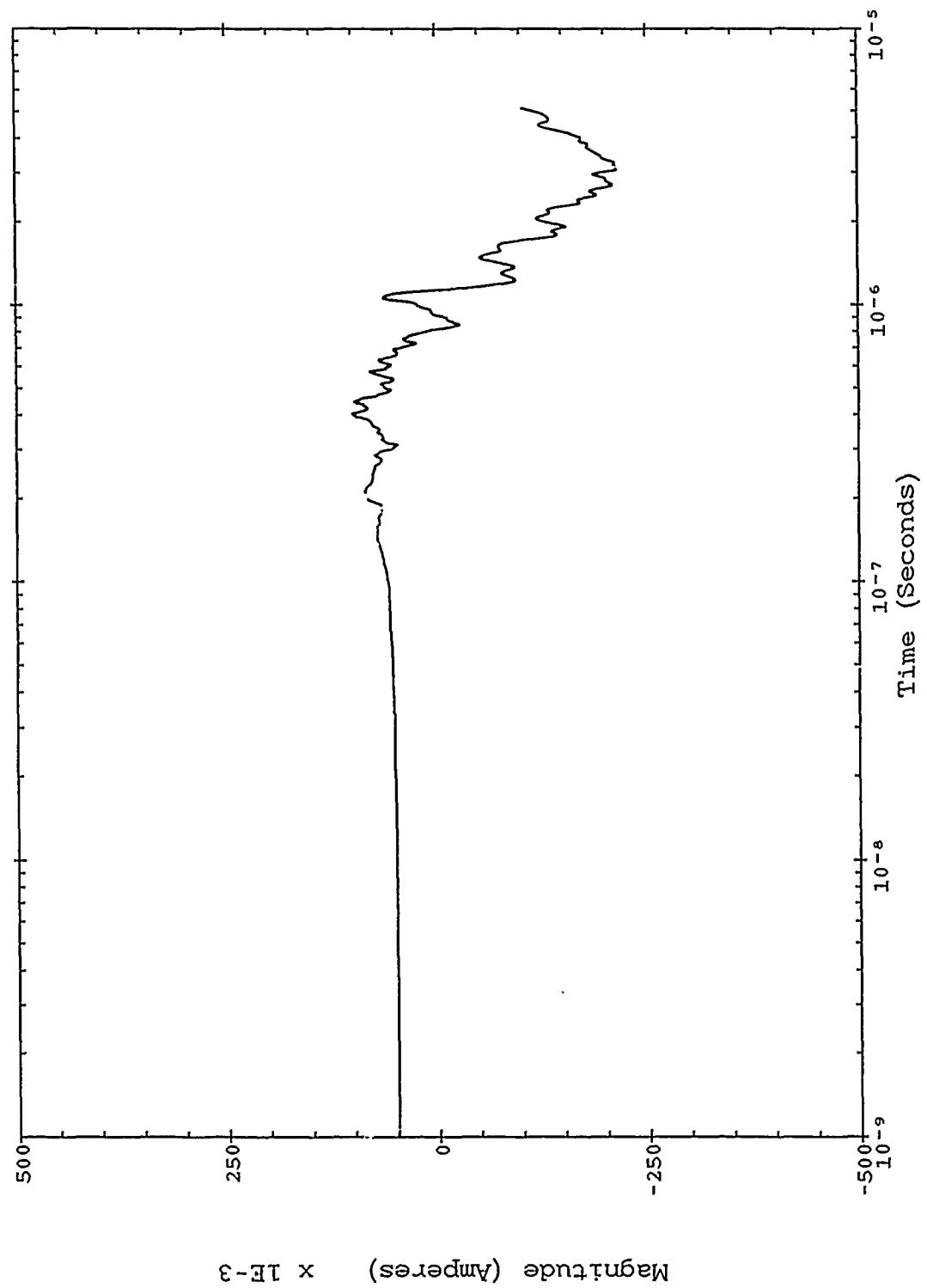


Figure B-238. Severe nearby lightning threat; TP 5283 SN 1717.

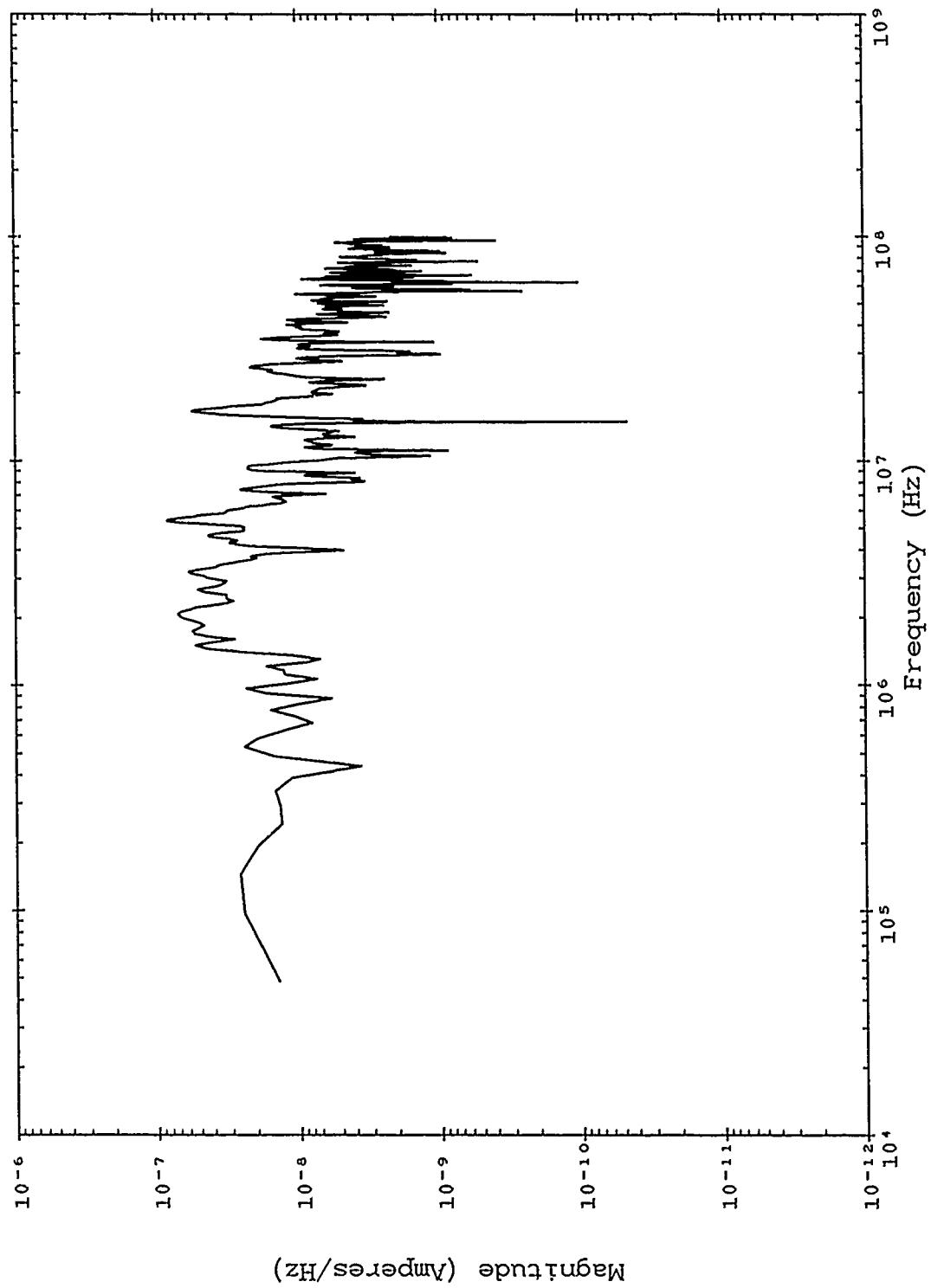


Figure B-239. Double exponential threat; TP 5283 SN 1717.

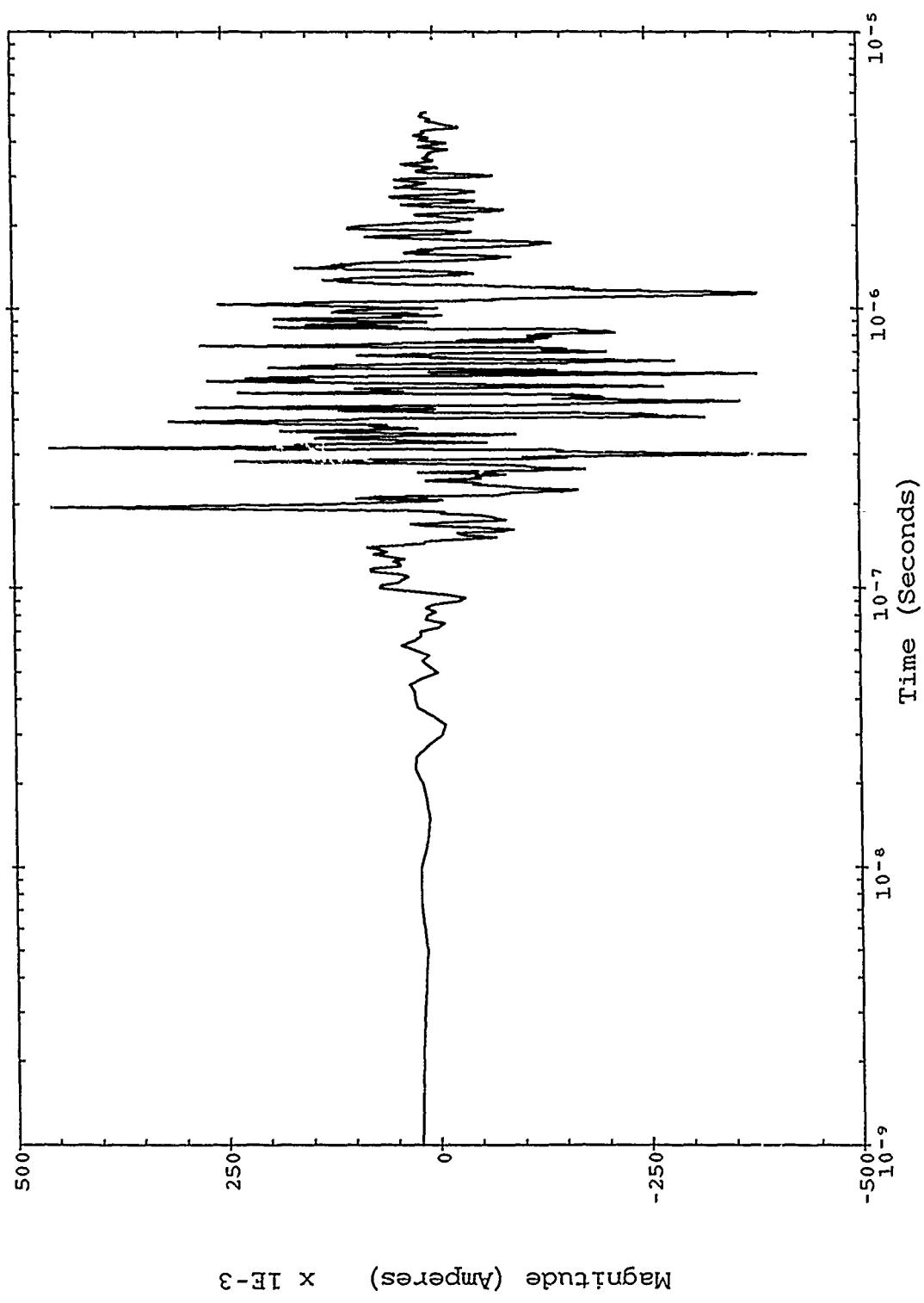


Figure B-240. Double exponential threat; TP 5283 SN 1717.

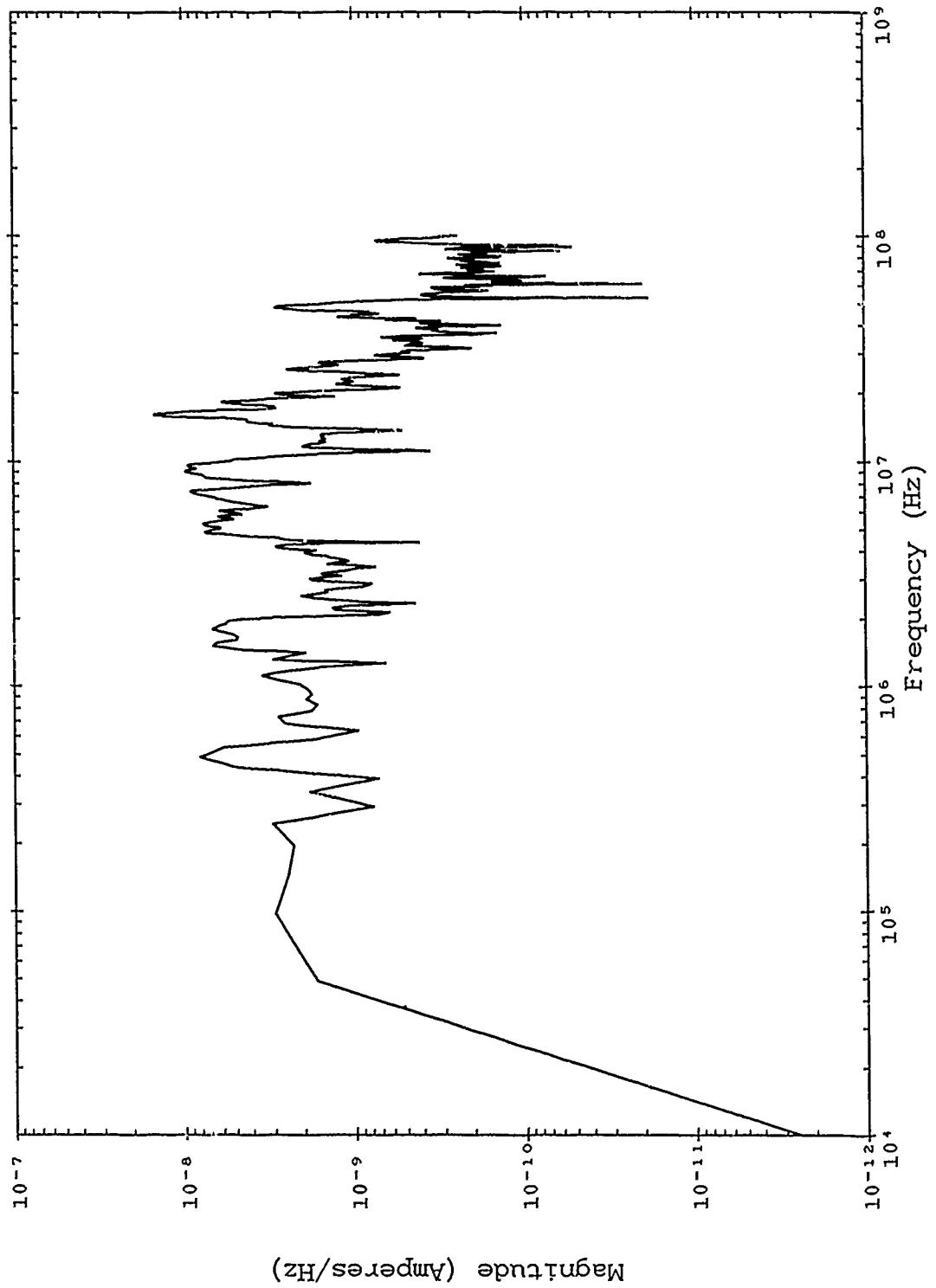


Figure B-241. Corrected TRESTLE data; TP 5352 SN 1234.

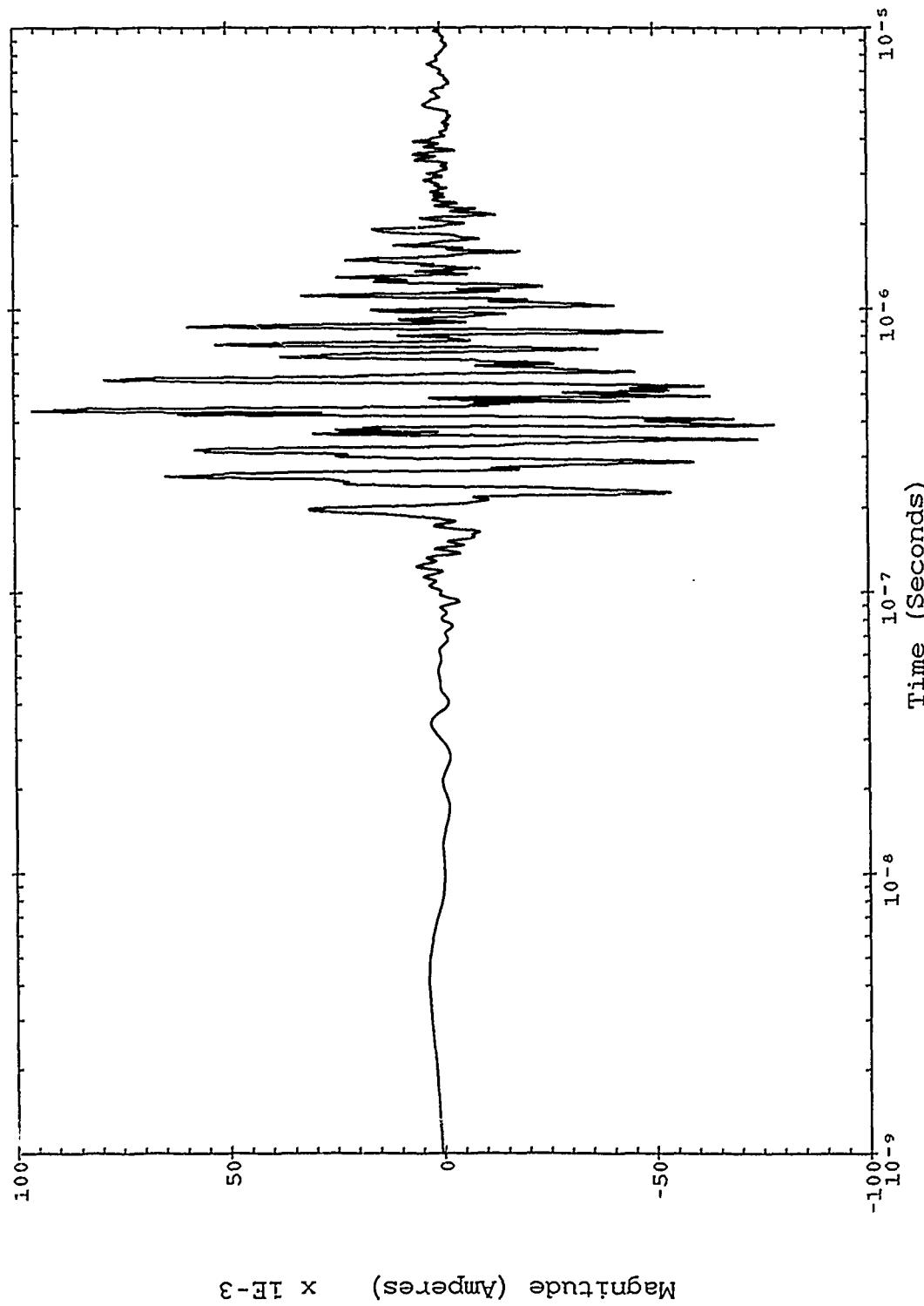


Figure B-242. Corrected TRESTLE data; TP 5352 SN 1234.

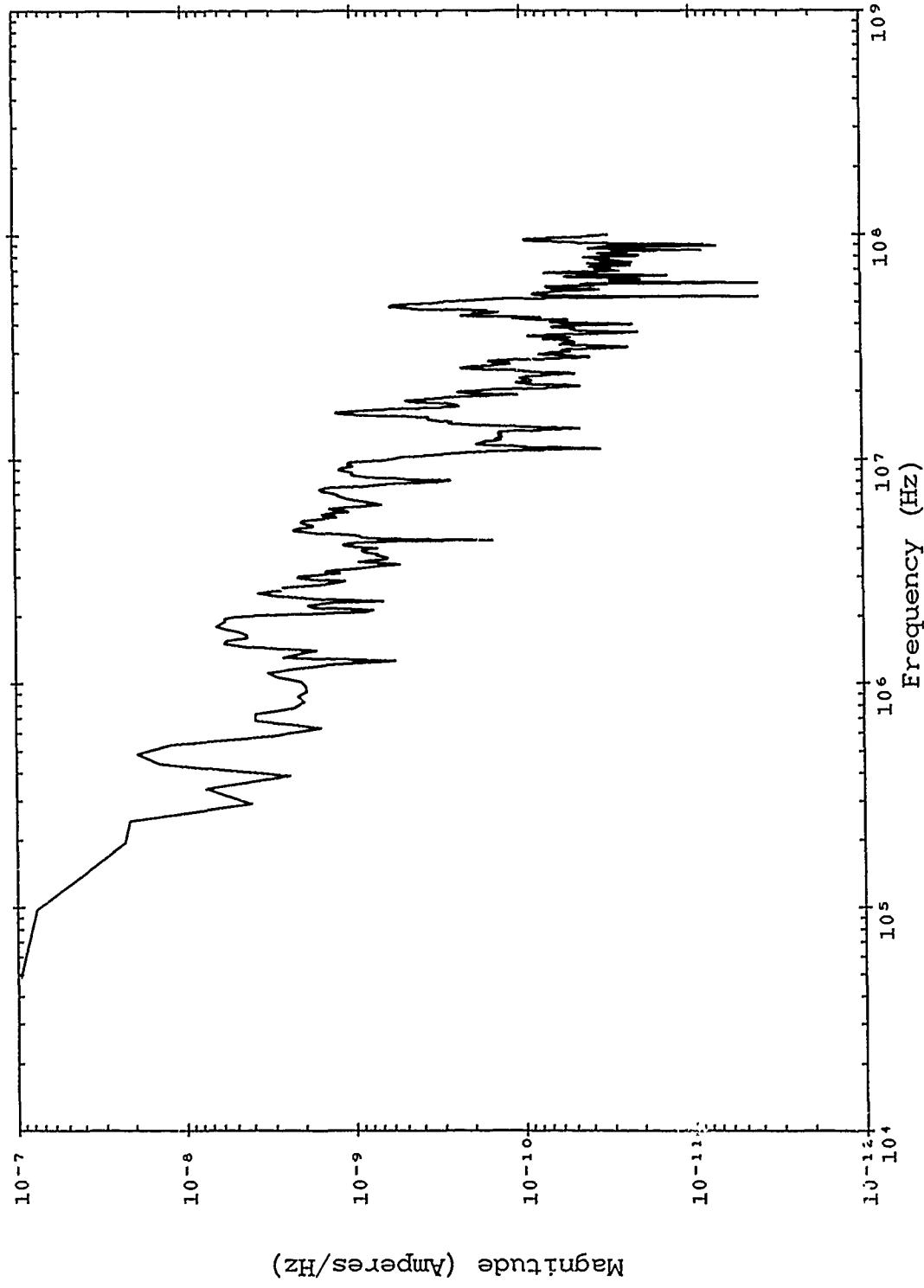


Figure B-243. Severe nearby lightning threat; TP 5352 SN 1234.

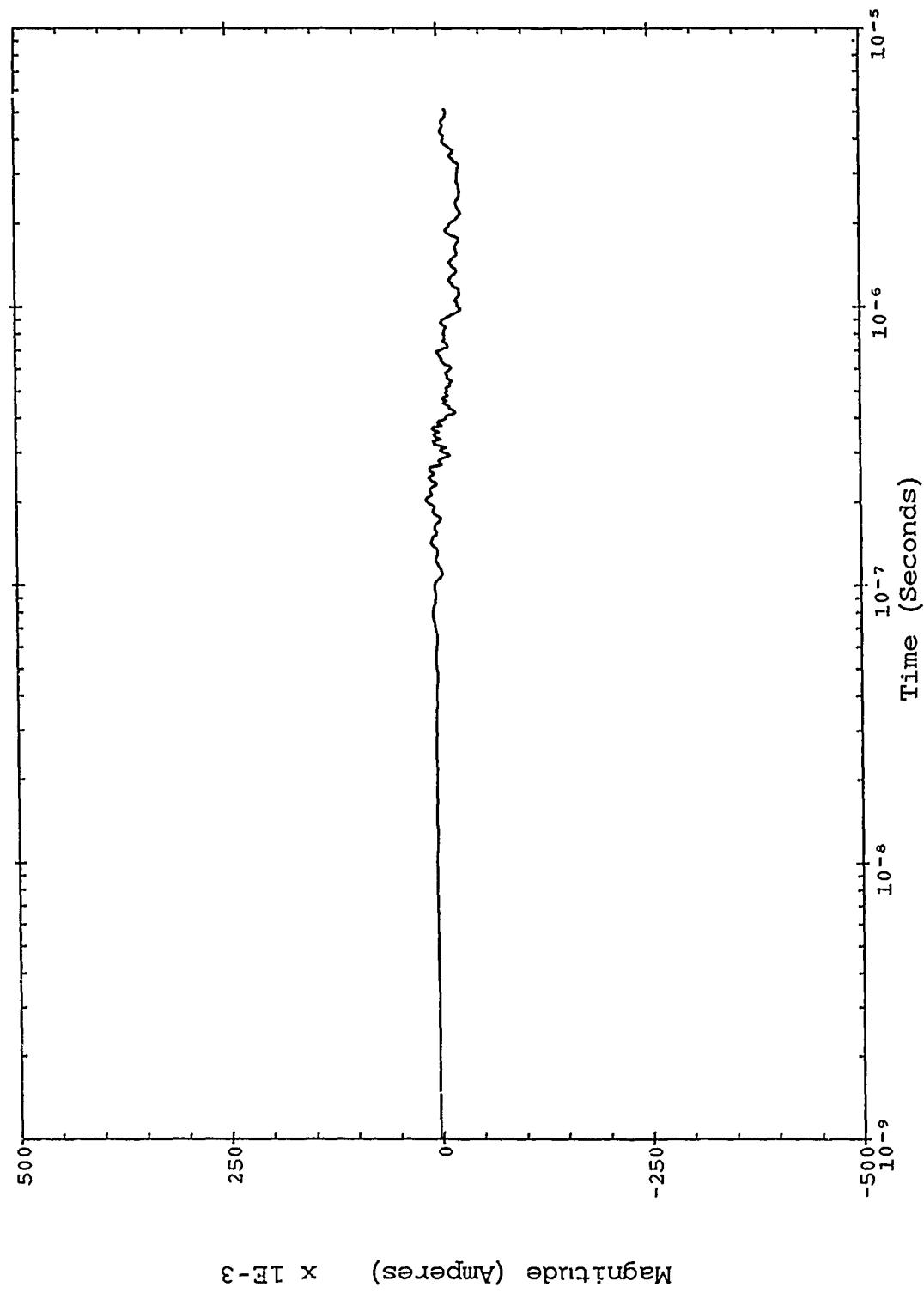


Figure B-244. Severe nearby lightning threat; TP 5352 SN 1234.

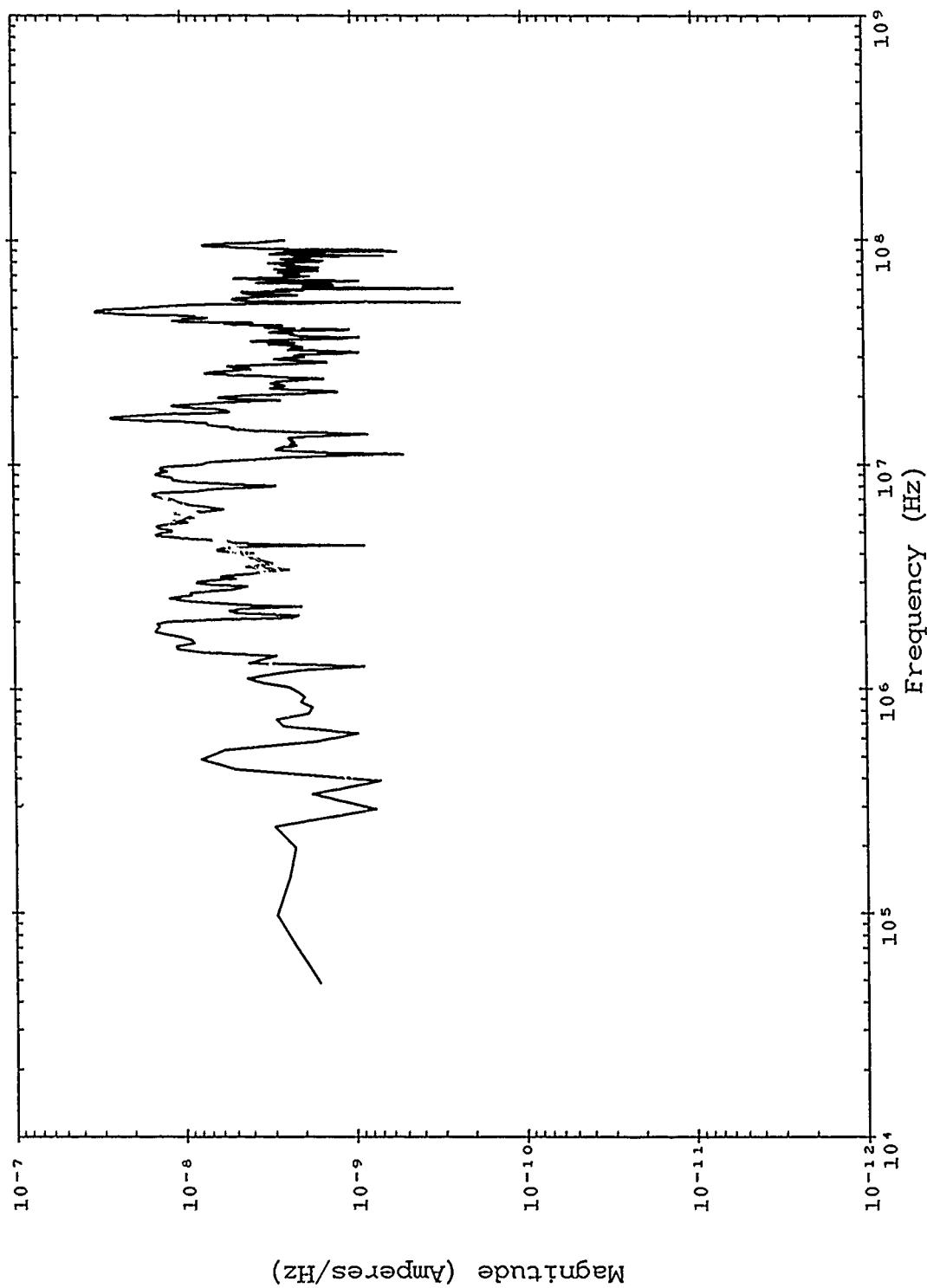


Figure B-245. Double exponential threat; IP 5352 SN 1234.

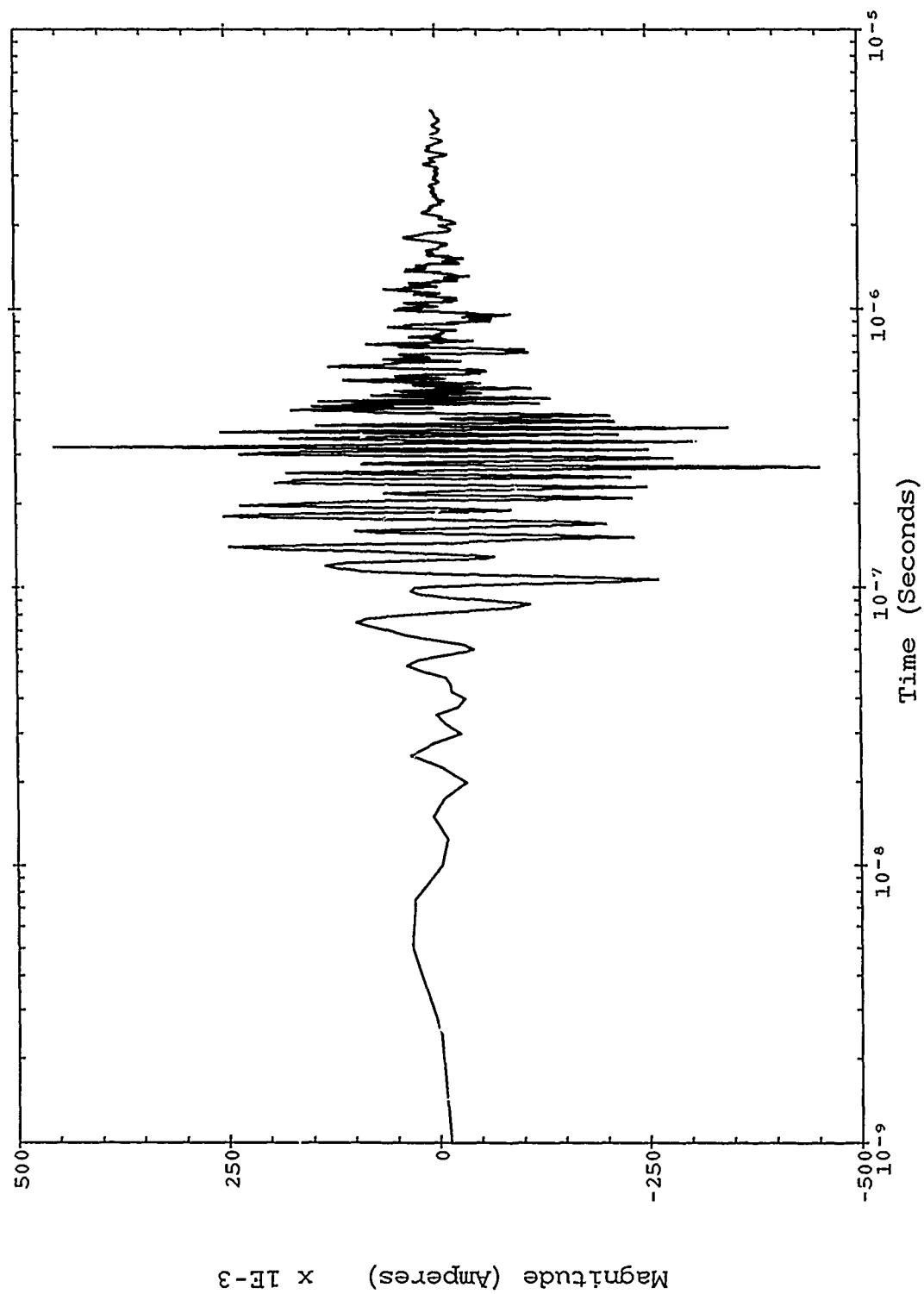


Figure B-246. Double exponential transient; TP 5352 SN 1234.

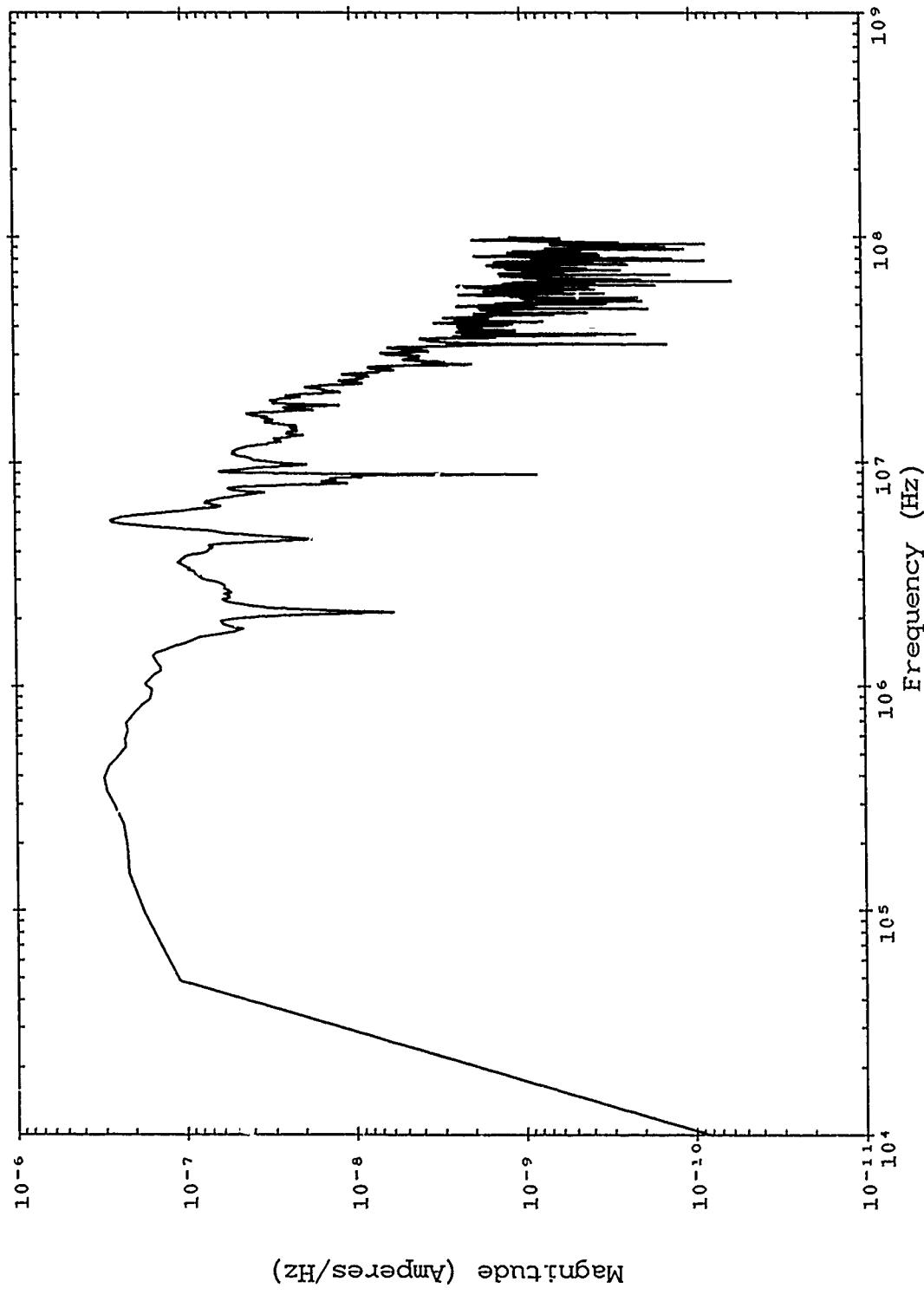


Figure B-247. Corrected TRESTLE data; TP 5393 SN 2623.

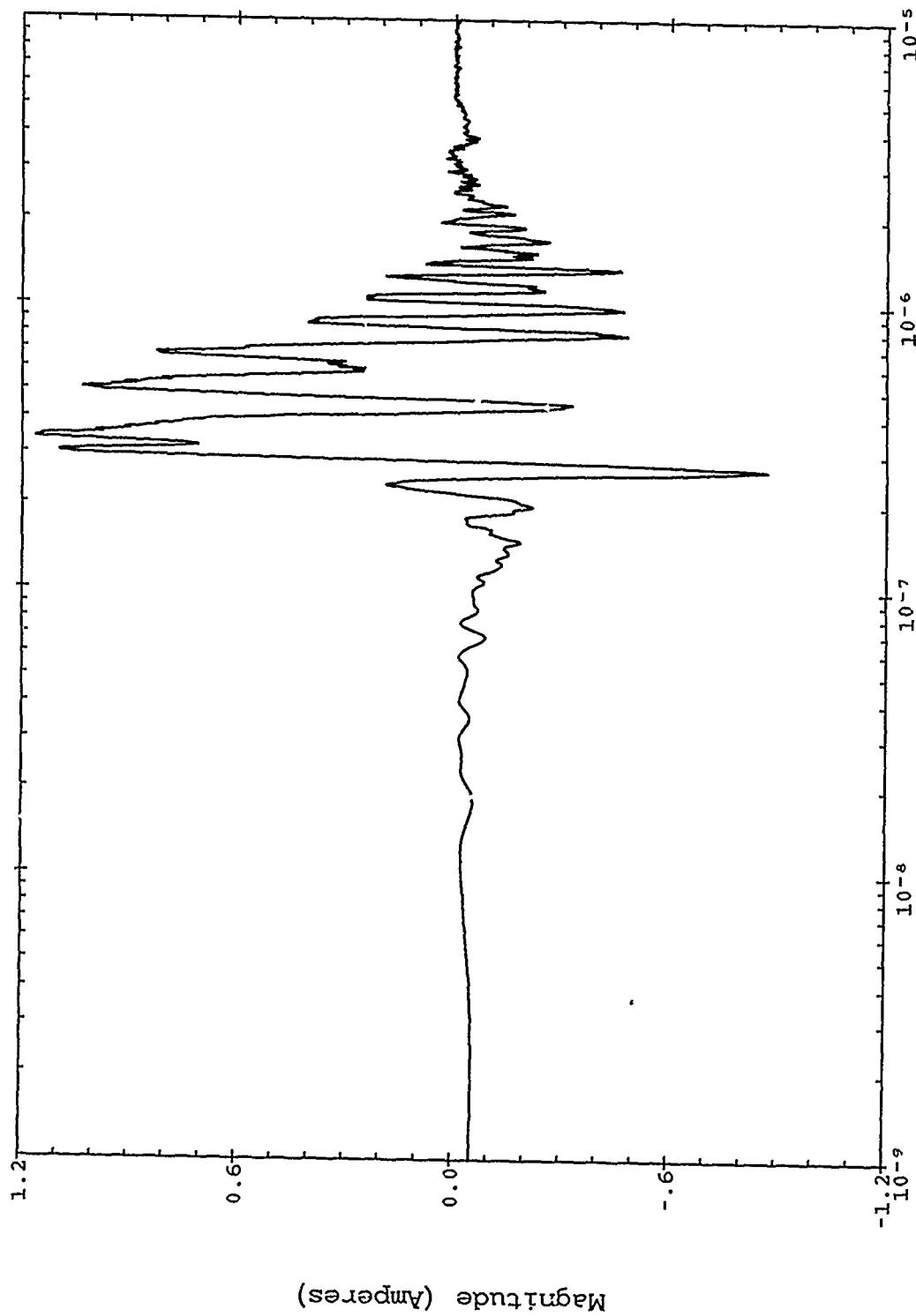


Figure B-248. Corrected TRESTLE data; TP 5393 SN 2623.

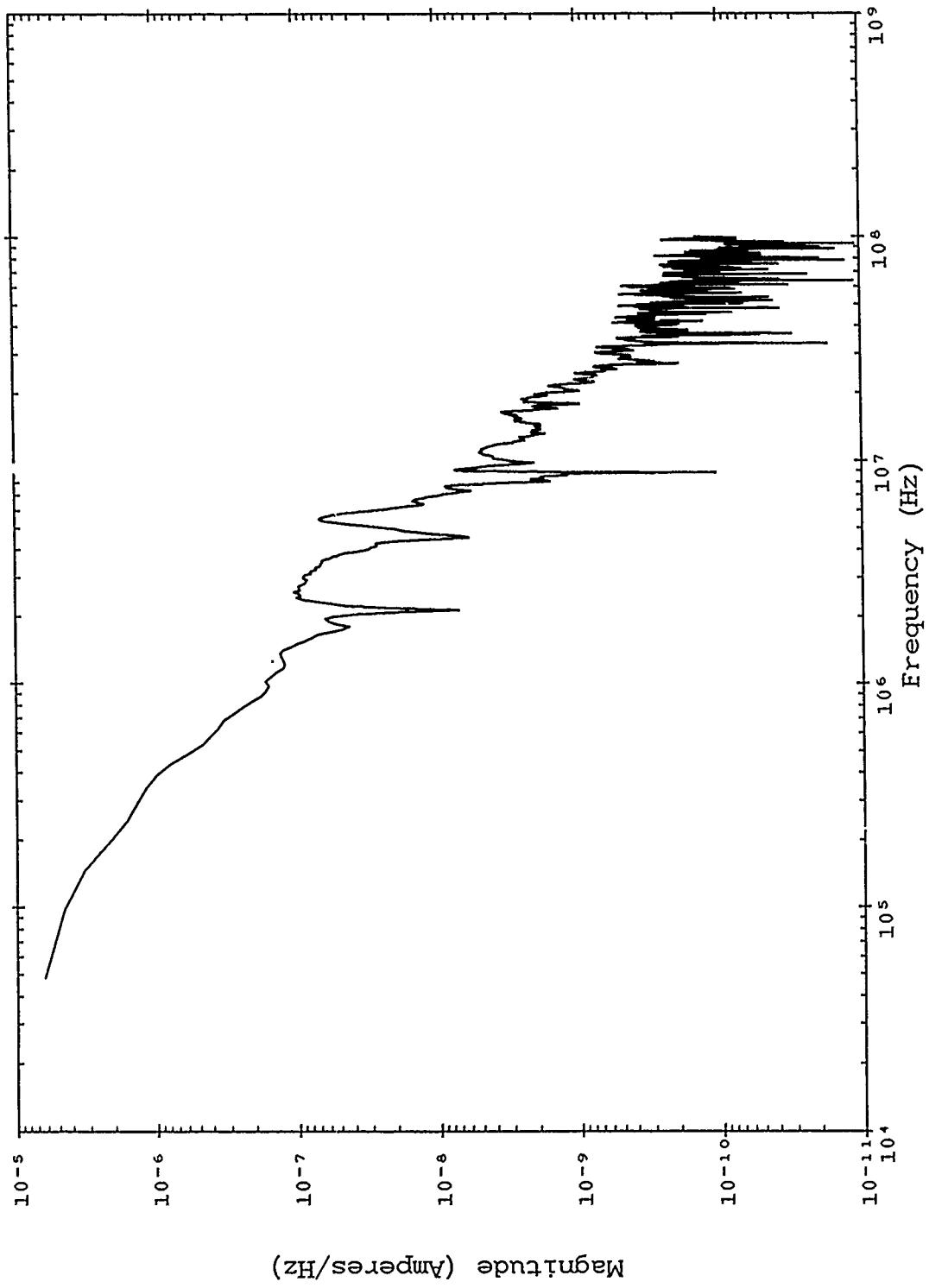


Figure B-249. Severe nearby lightning threat; TP 5393 SN 2623.

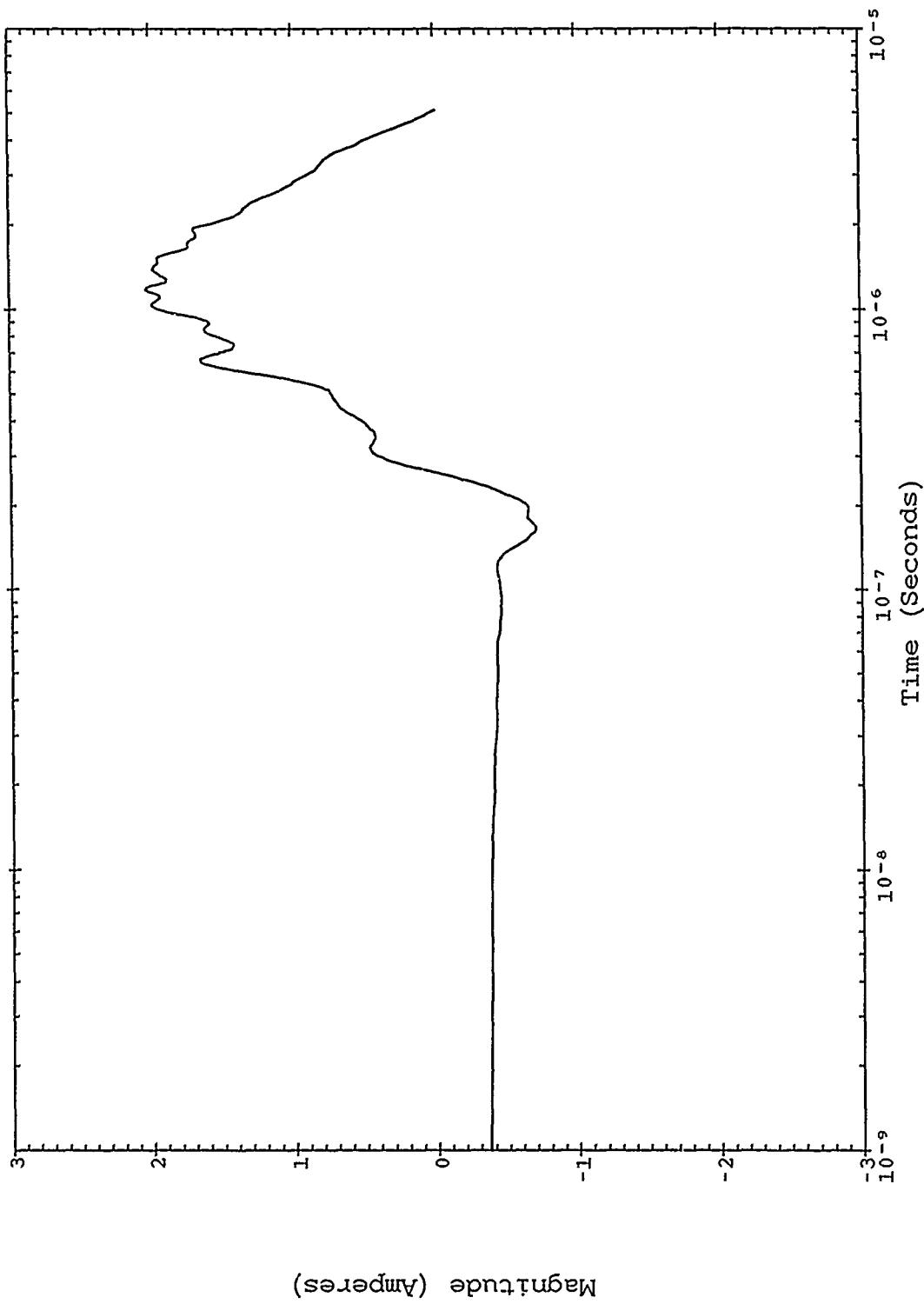


Figure B-250. Severe nearby lightning threat; TP 5393 SN '2623.

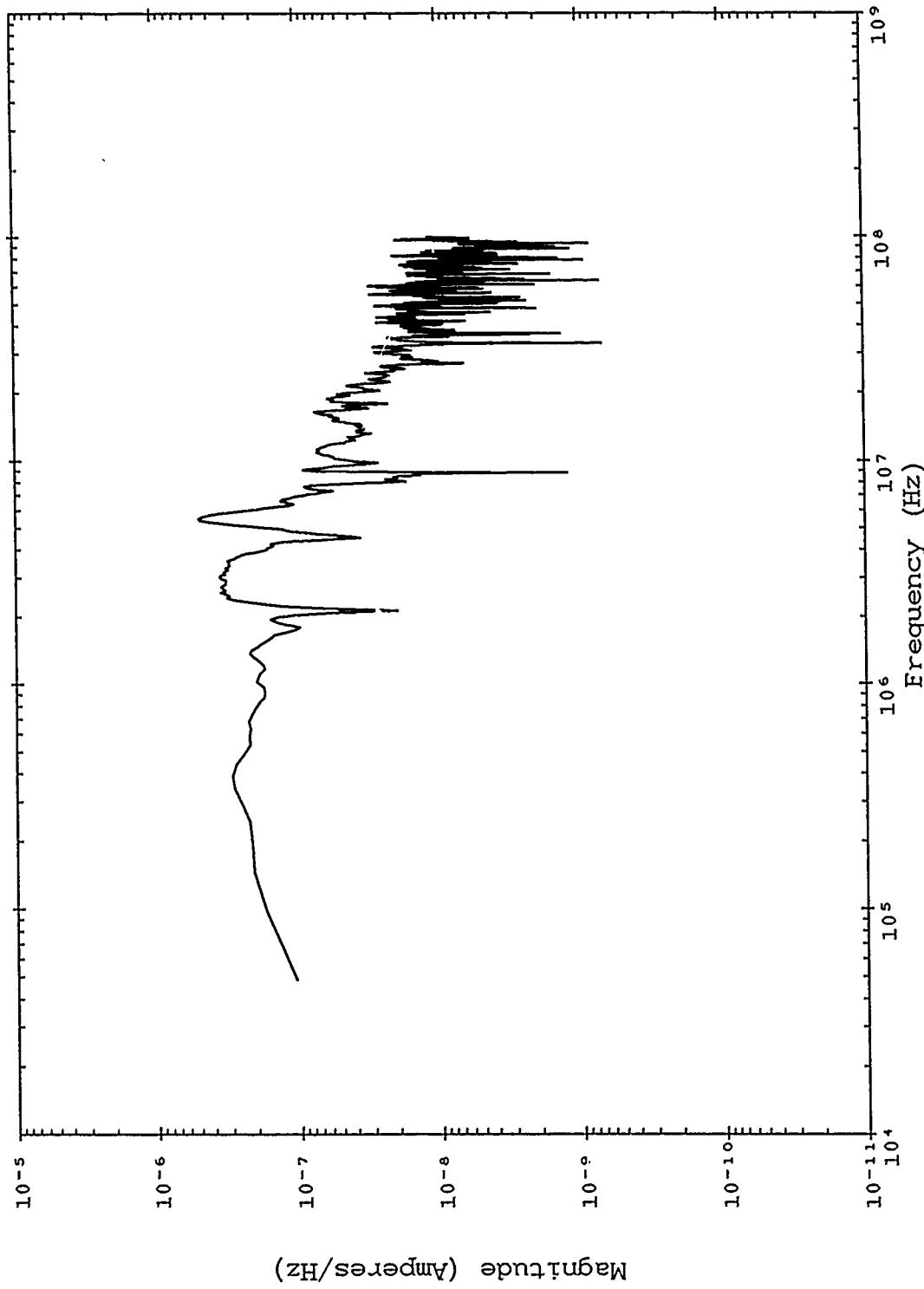


Figure B-251. Double exponential threat; TP 5393 SN 2623.

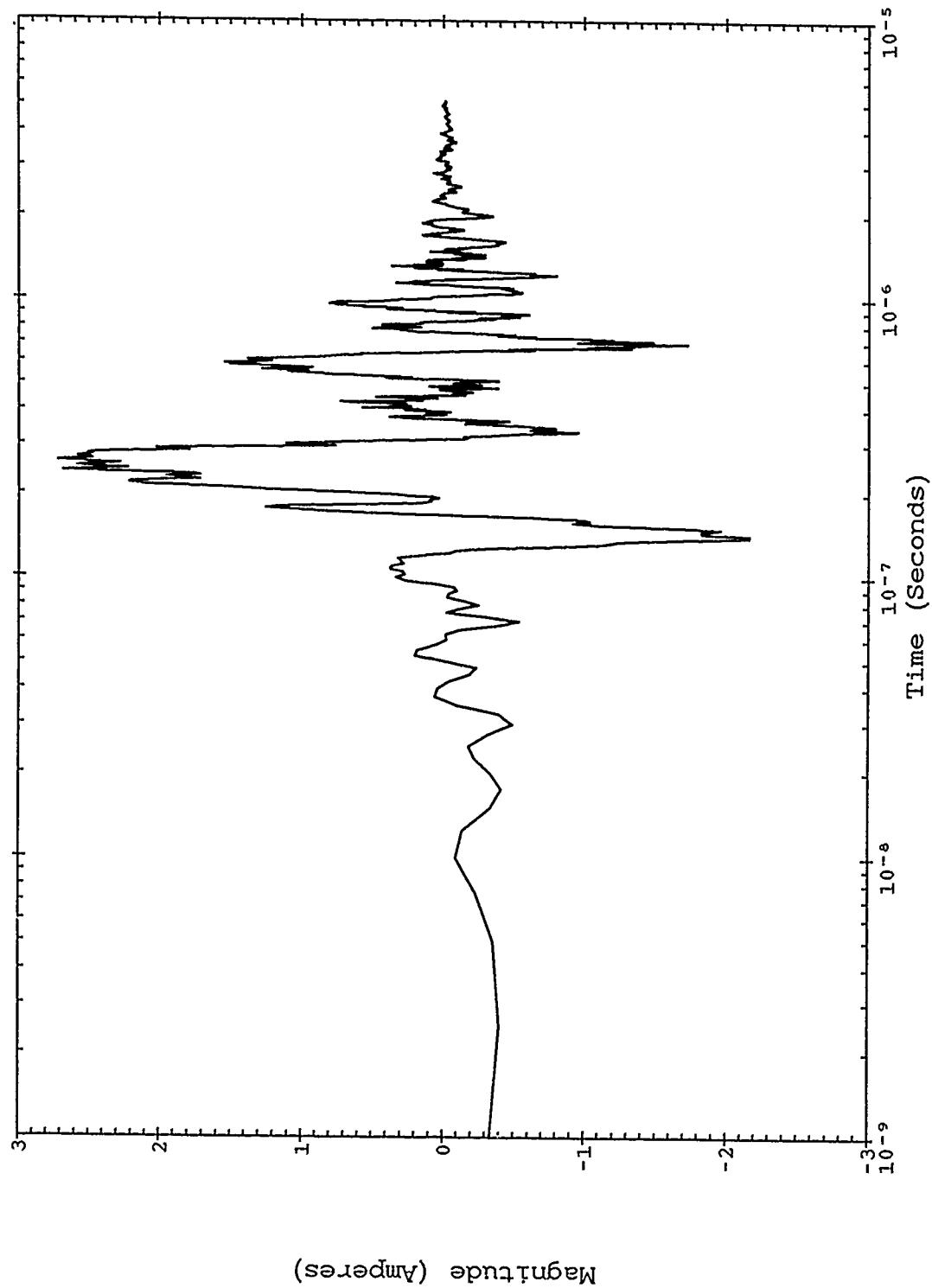


Figure B-252. Double exponential threat; TP 5393 SN 2623.

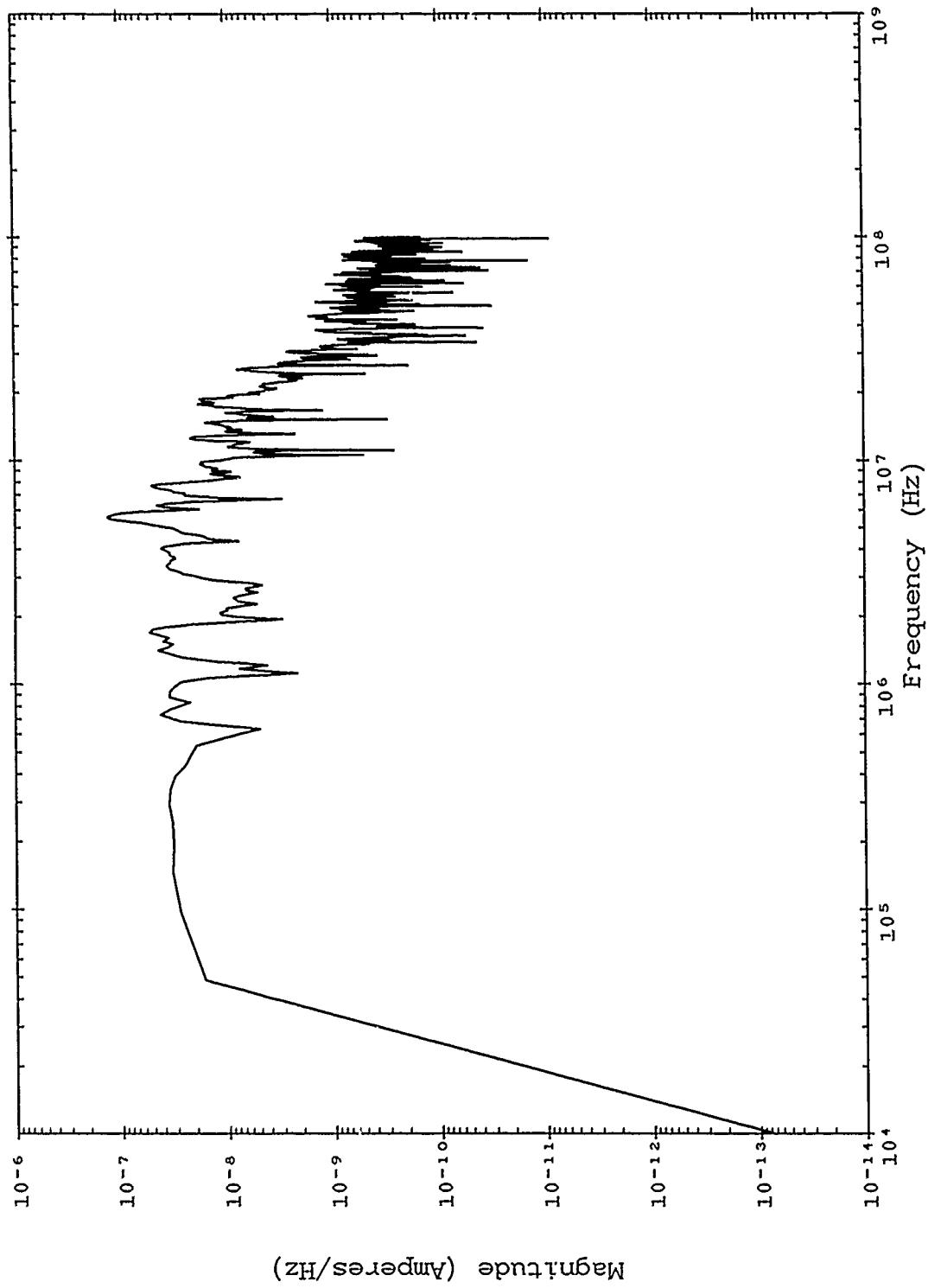


Figure B-253. Corrected TRESTLE data; TP 5415 SN 2700.

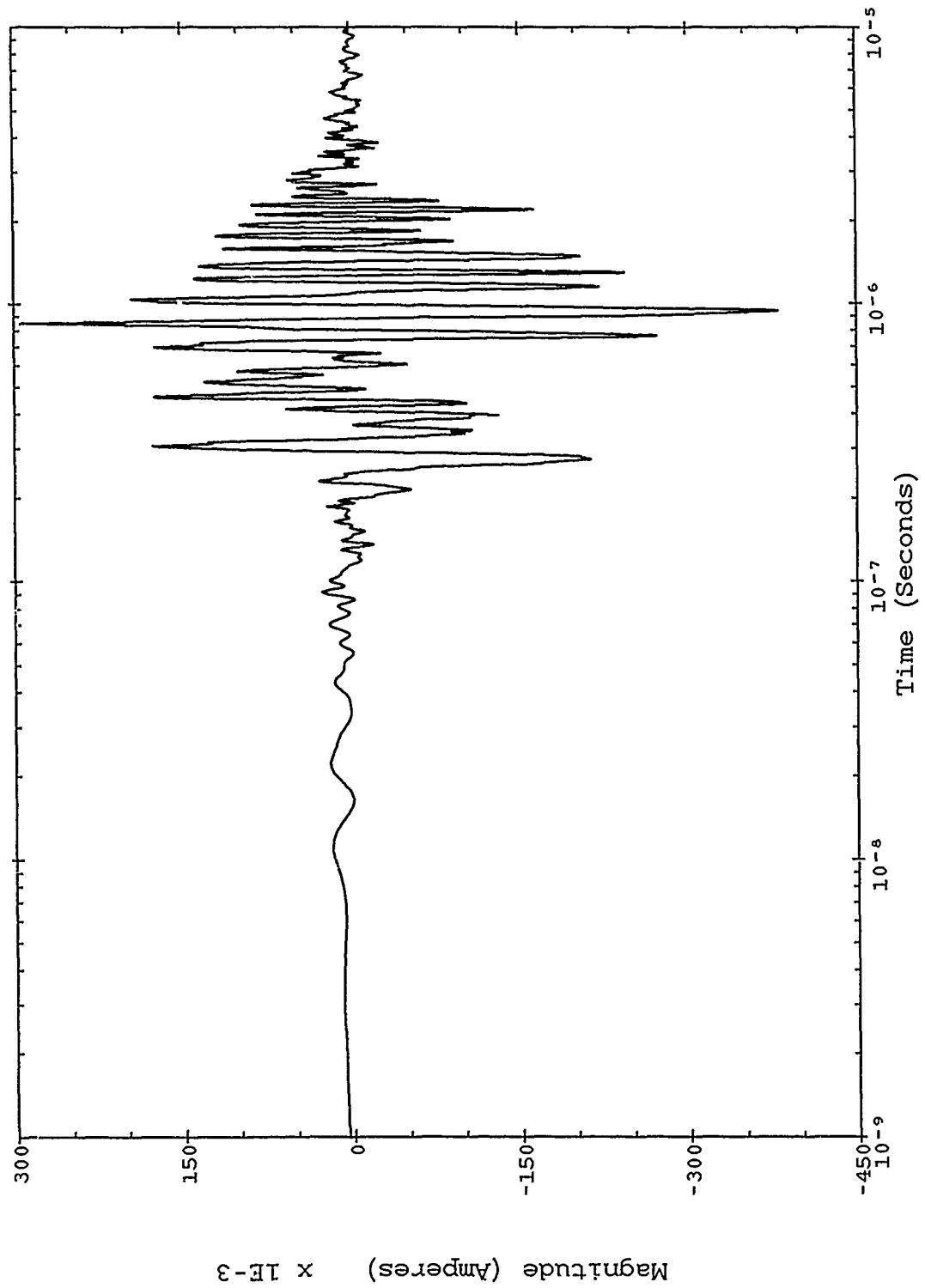


Figure B-254. Corrected TRESTLE data; TP 5415 SN 2700.

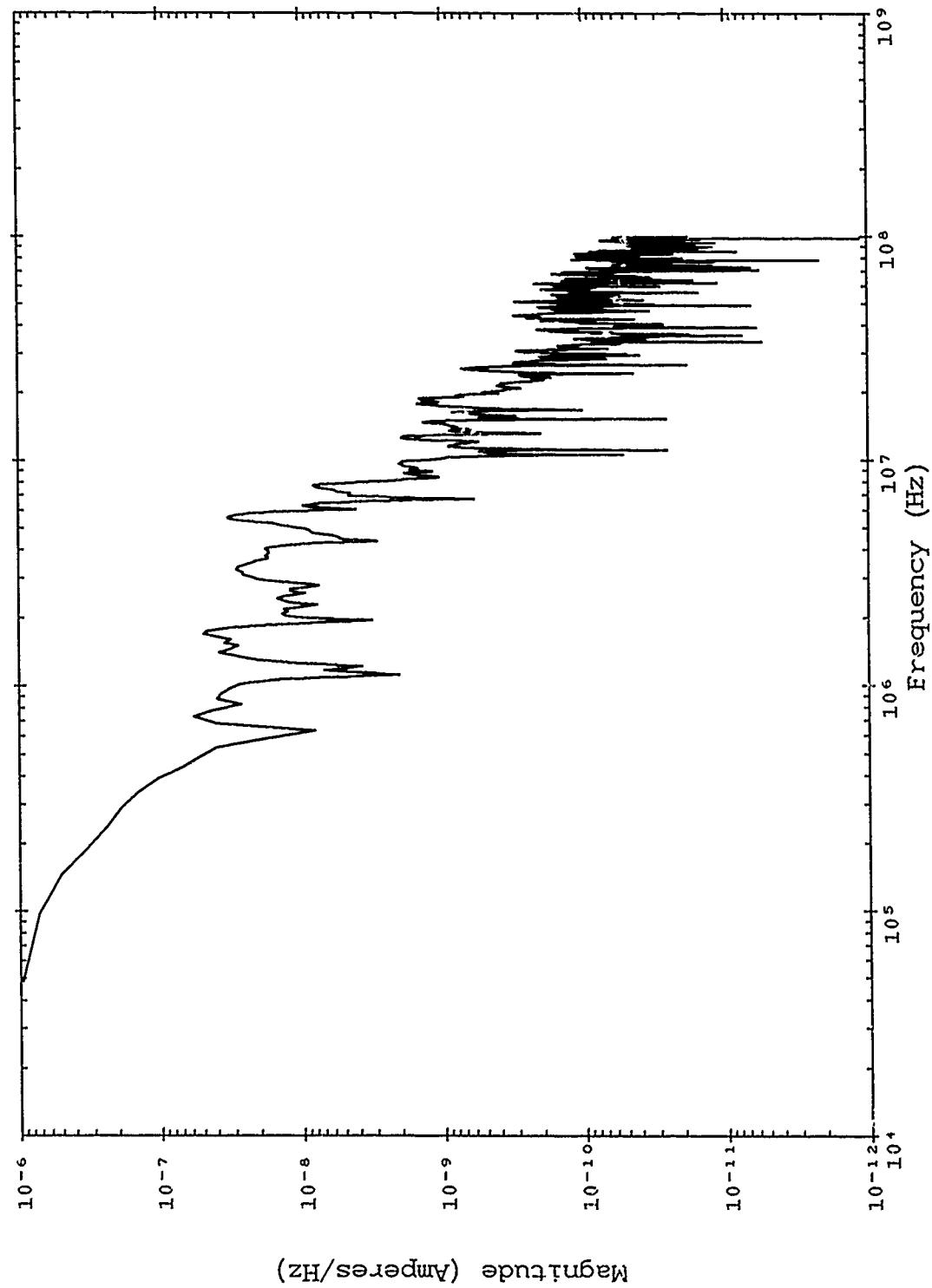


Figure B-255. Severe nearby lightning threat; TP 5415 SN 2700.

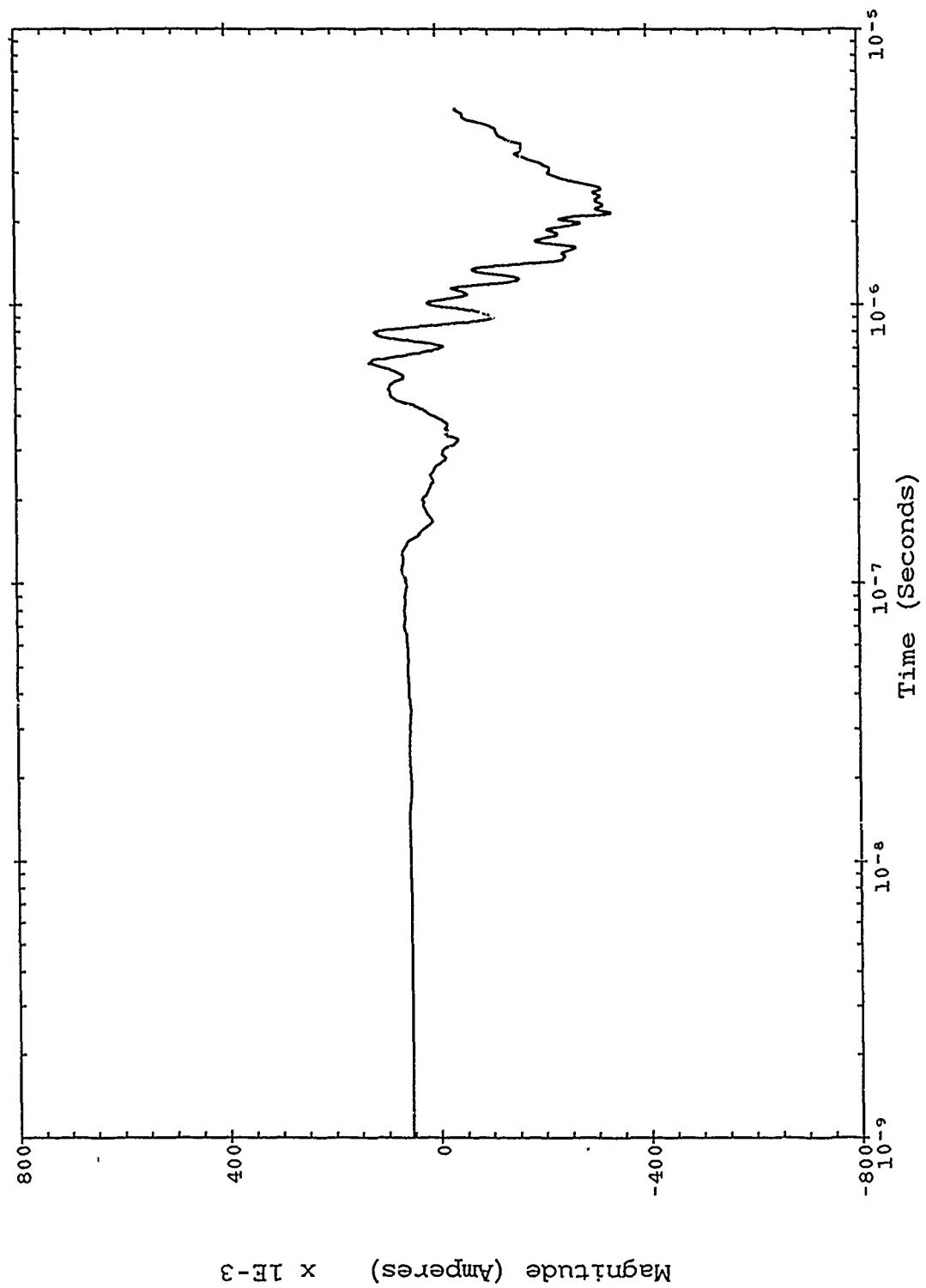


Figure B-256. Severe nearby lightning threat; TP 5415 SN 2700.

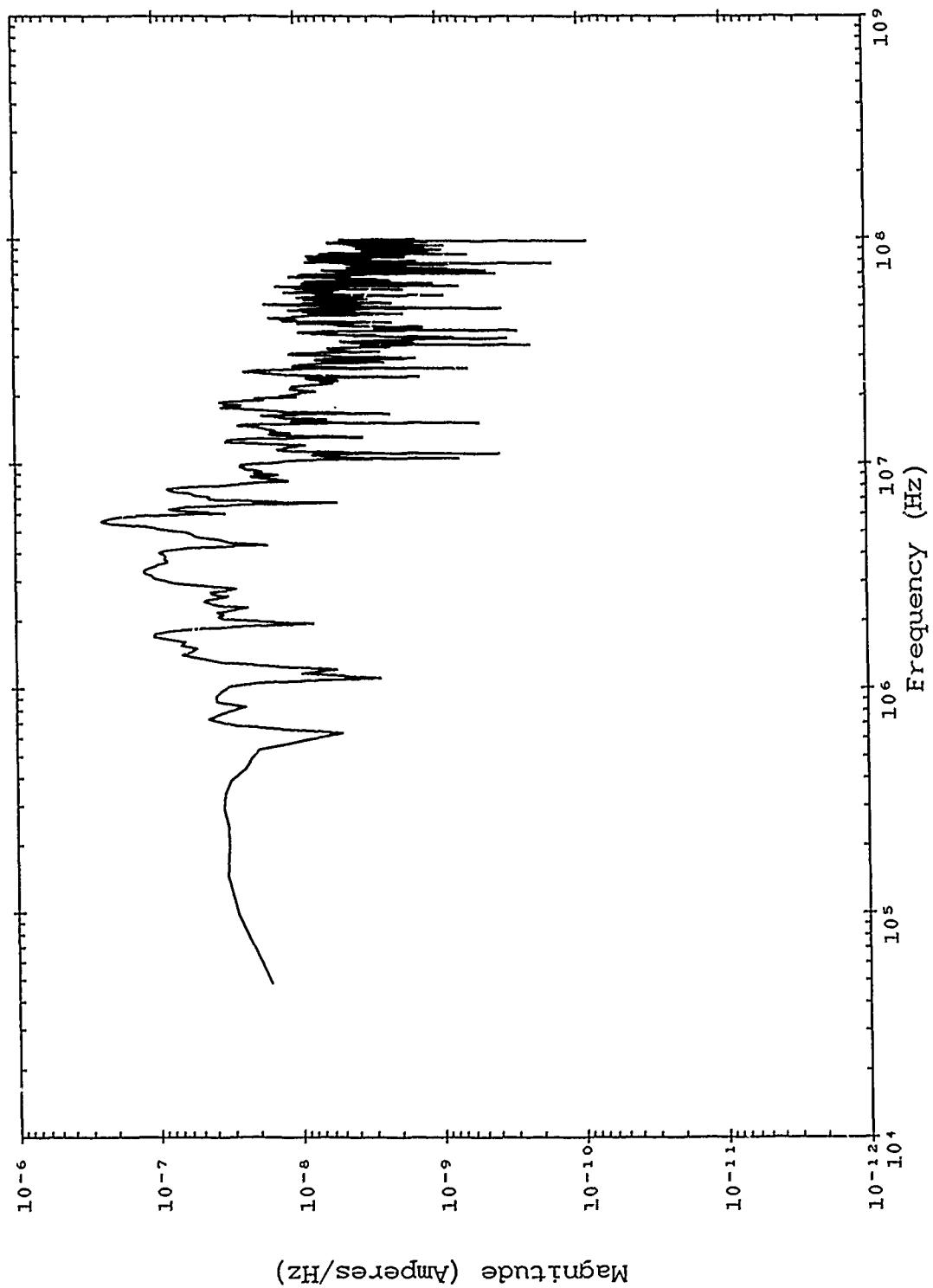


Figure B-257. Double exponential threat; TP 5415 SN 2700.

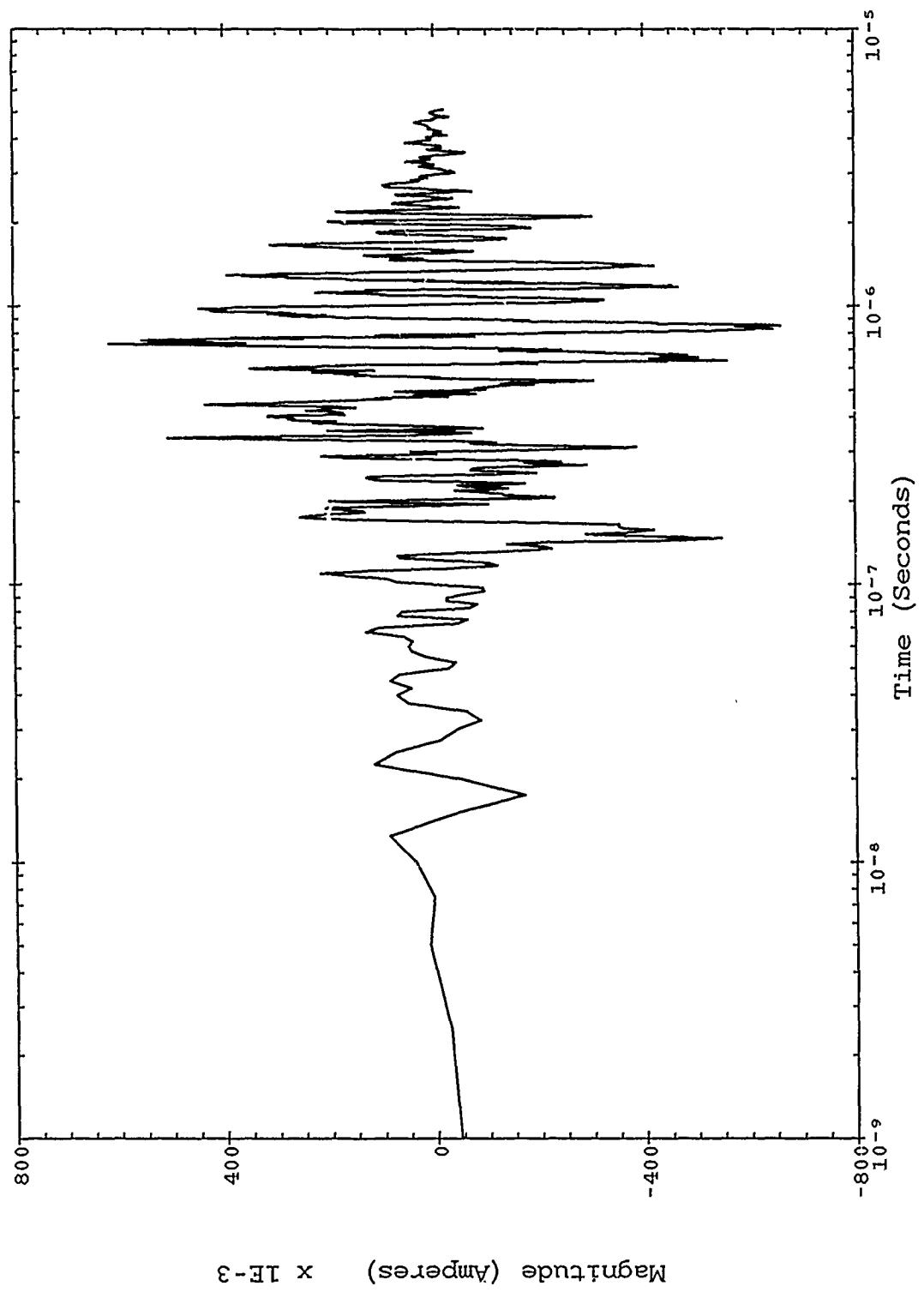


Figure B-258. Double exponential threat; TP 5415 SN 2700.

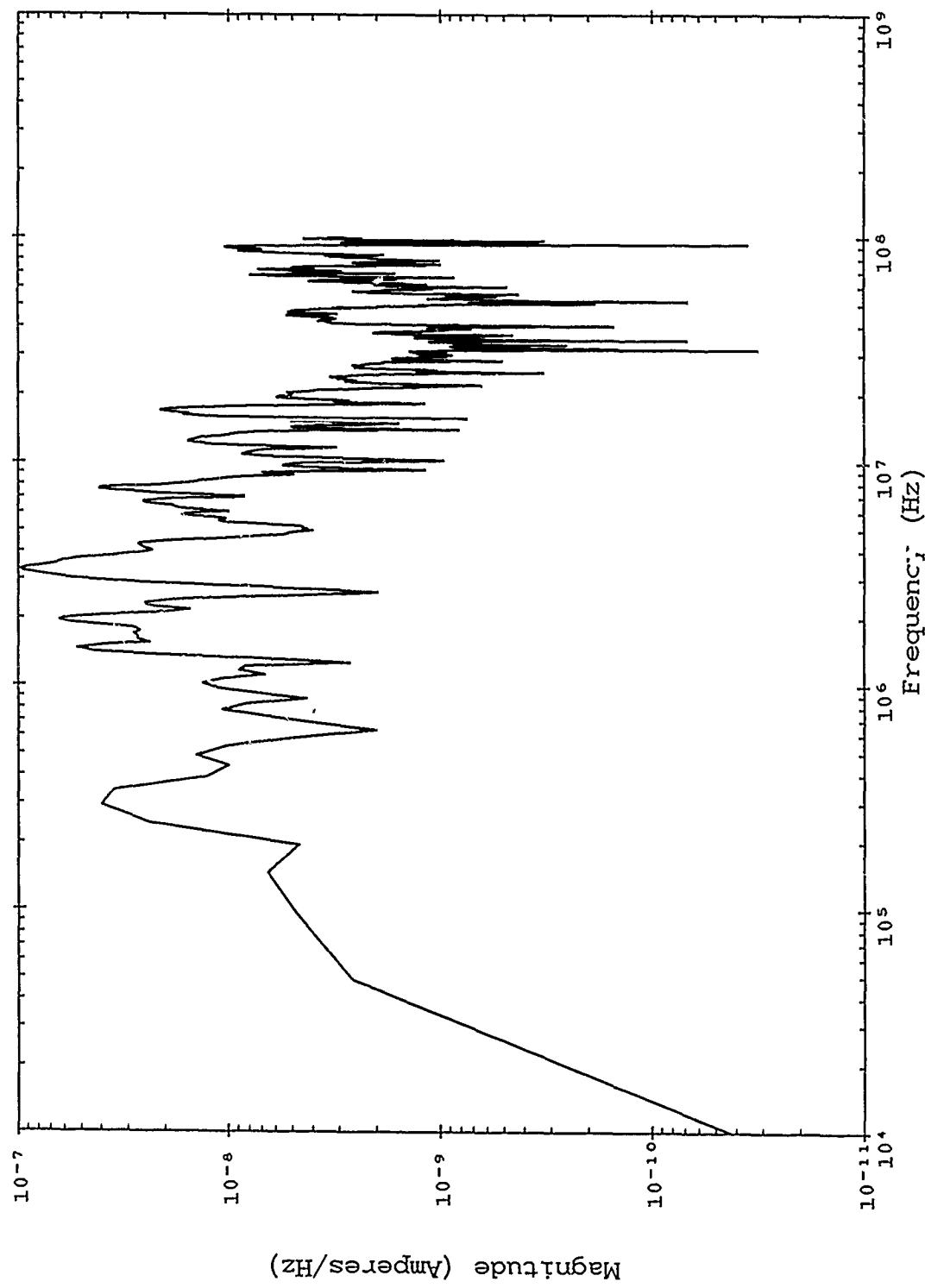


Figure B-259. Corrected TRESTLE data; TP 5511 SN 2274.

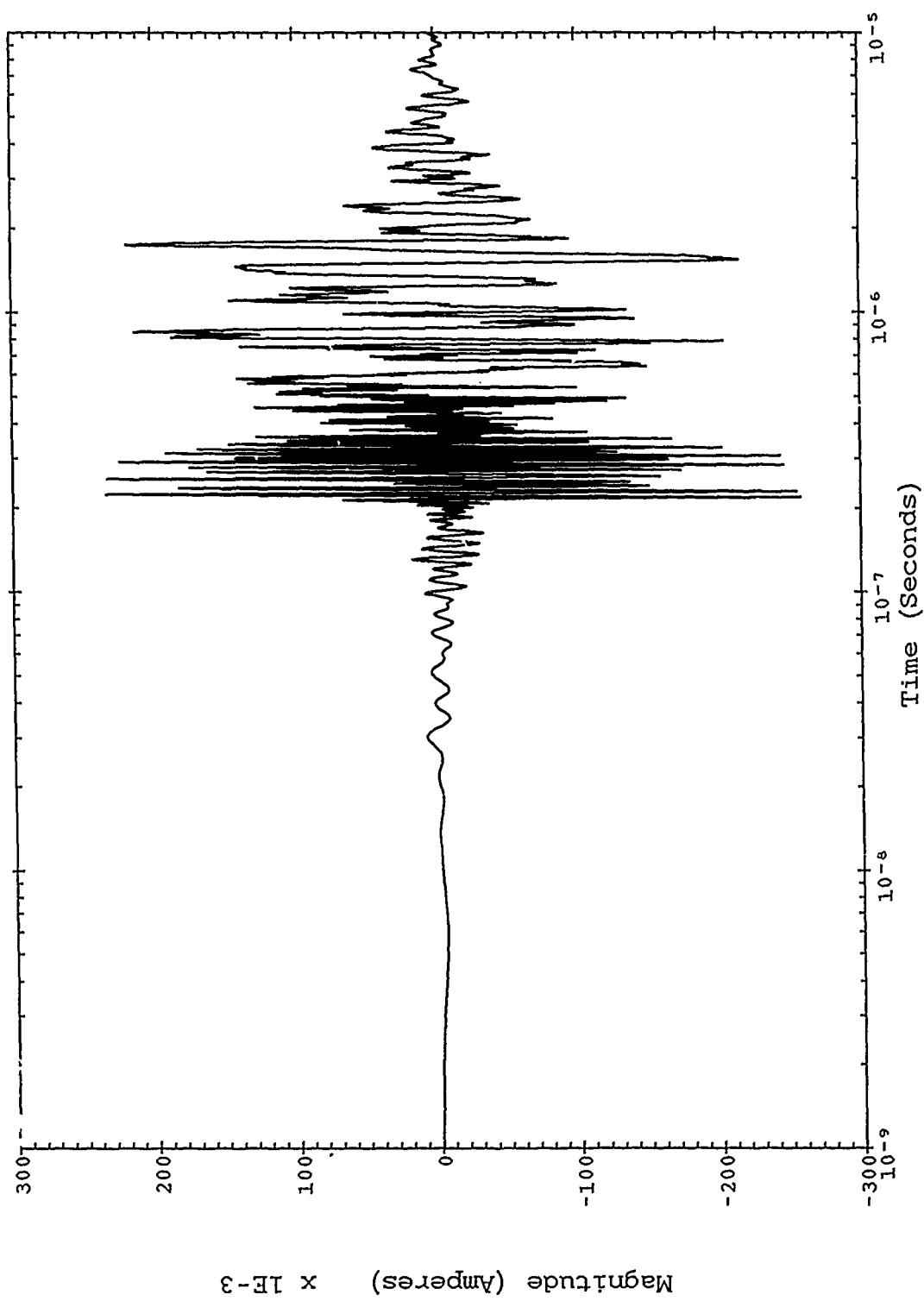


Figure B-260. Corrected TRESTLE data; TP 5511 SN 2274.

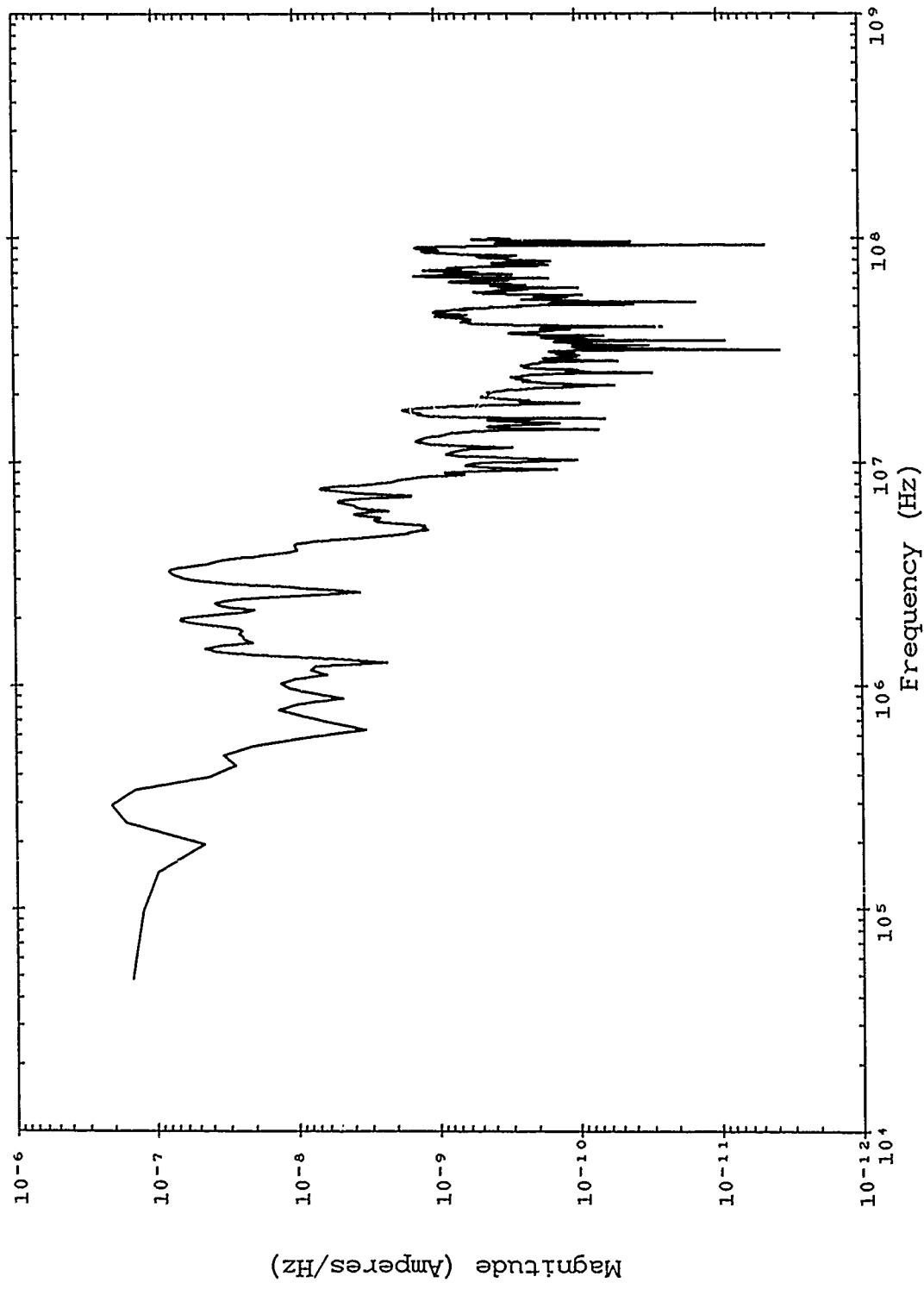


Figure B-261. Severe nearby lightning threat; TP 5511 SN 2274.

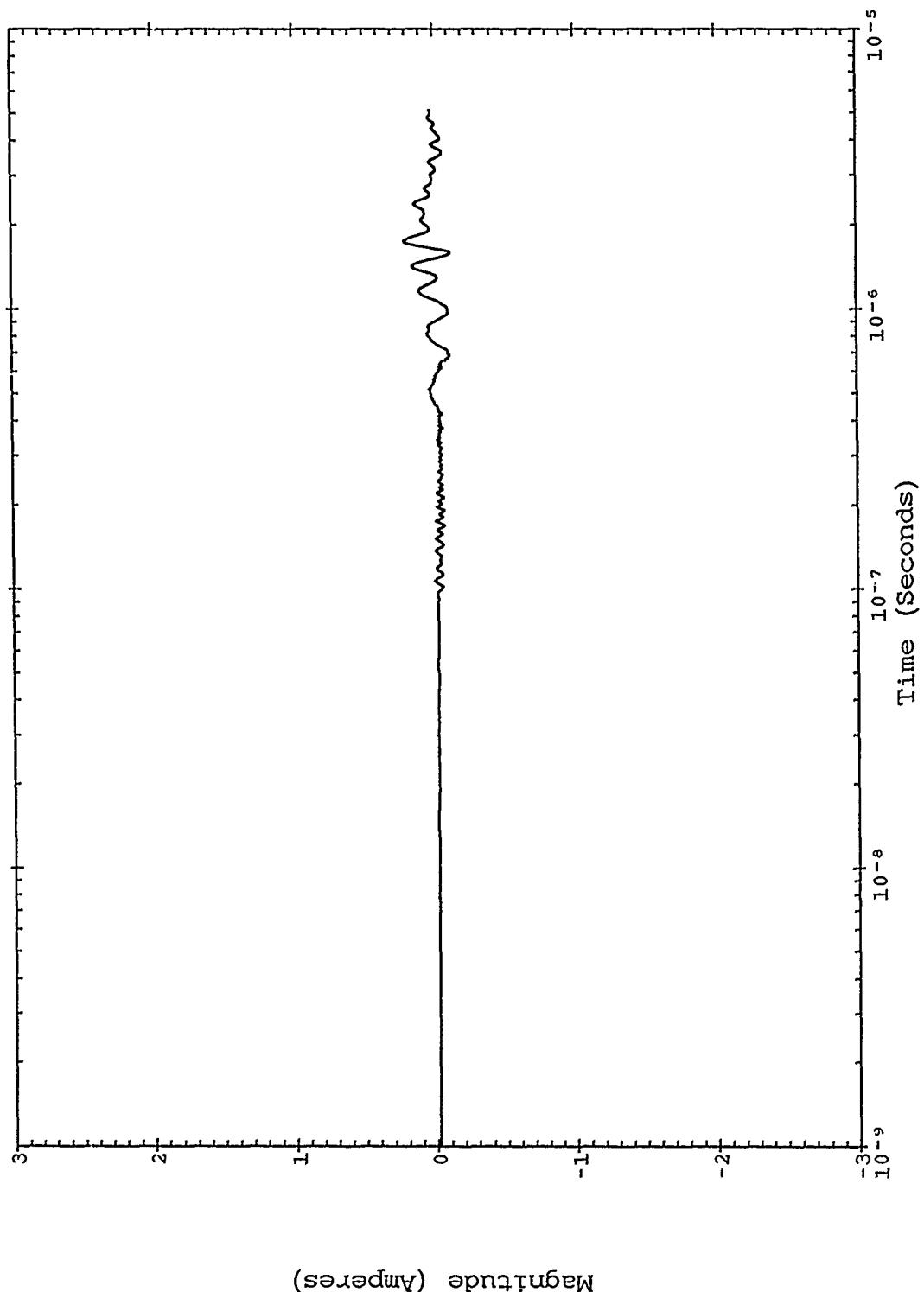


Figure B-262. Severe nearby lightning threat; TP 5511 SN 2274.

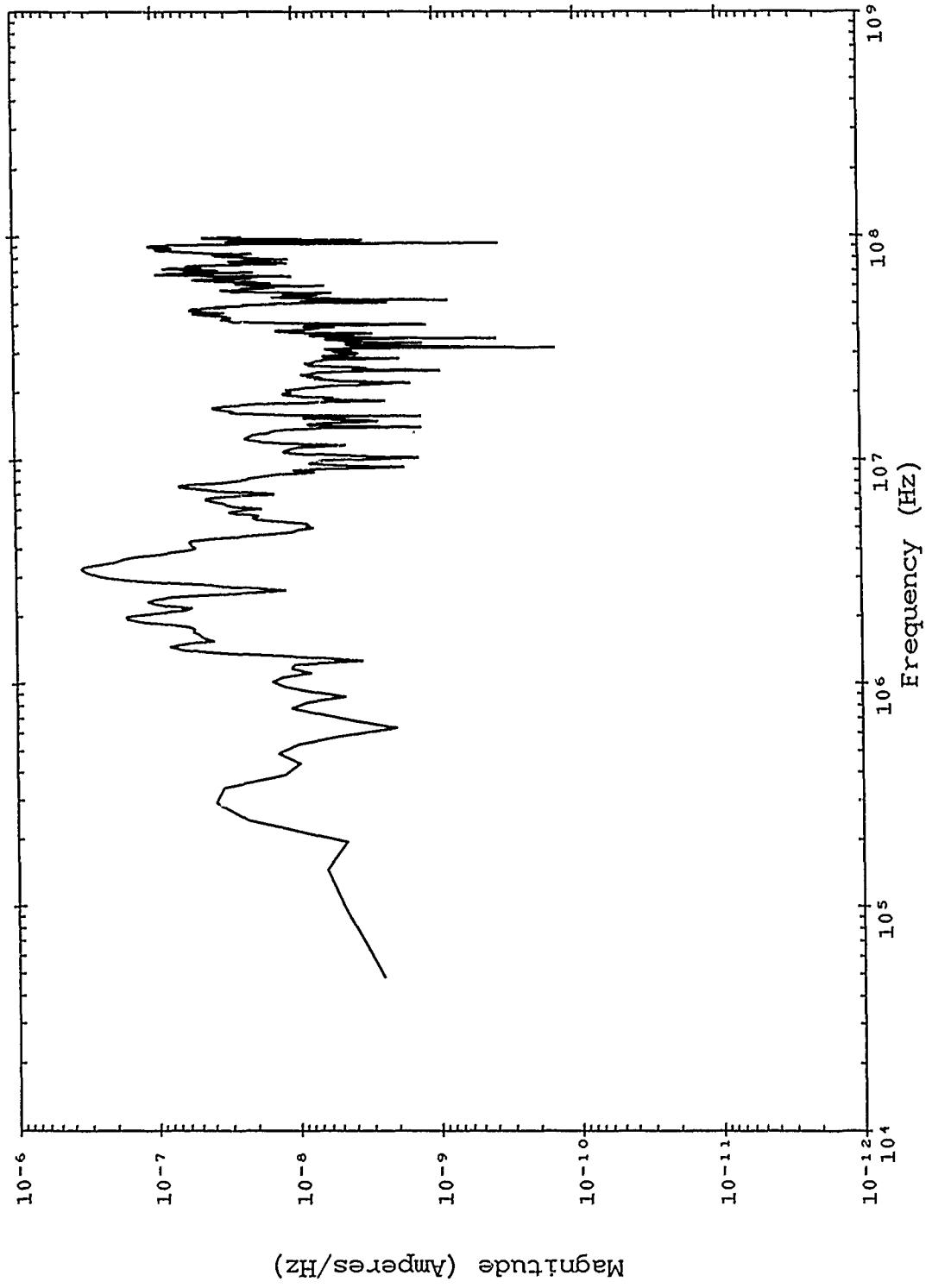


Figure B-263. Double exponential threat; TP 5511 SN 2274.

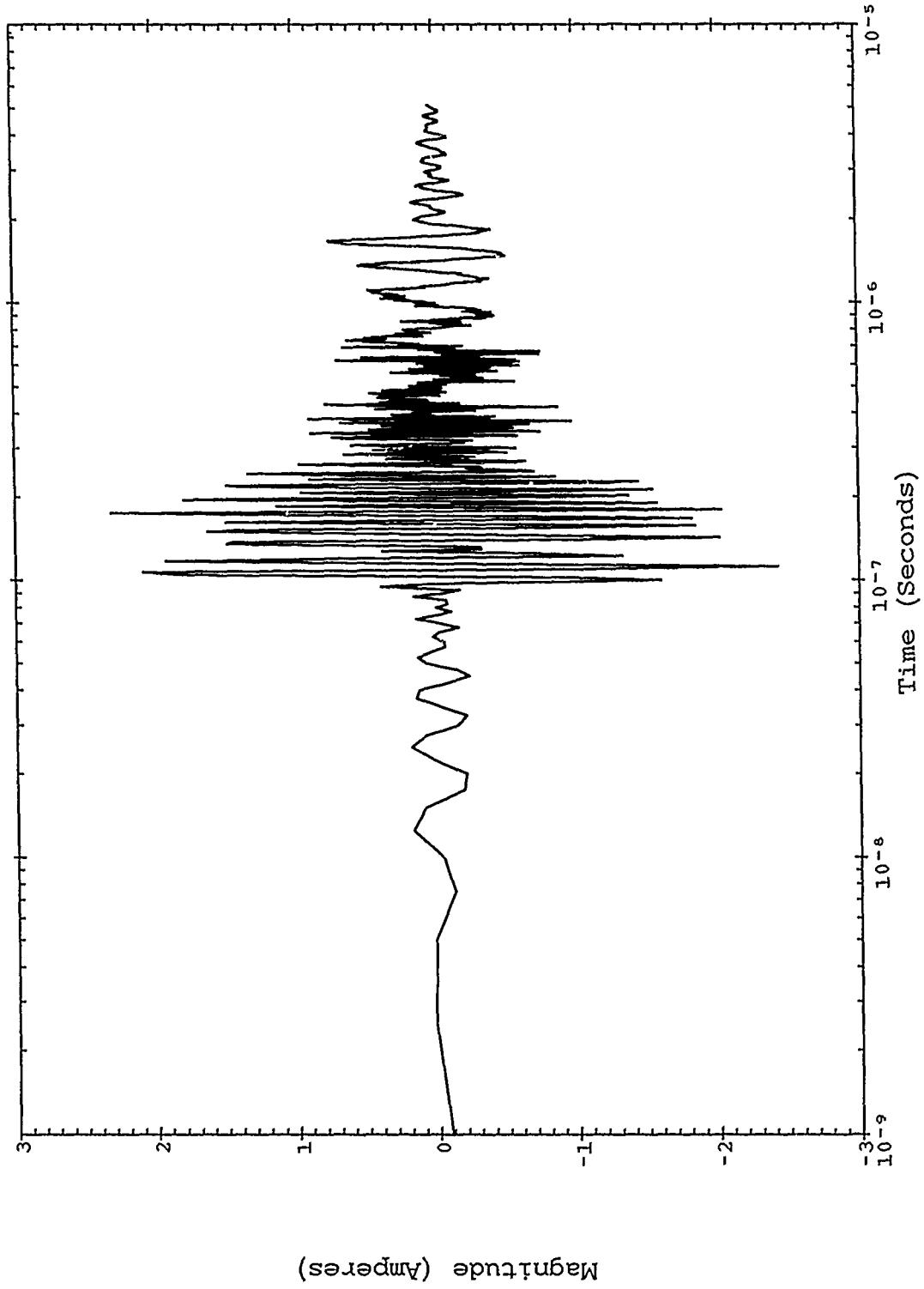


Figure B-264. Double exponential threat; TP 5511 SN 2274.

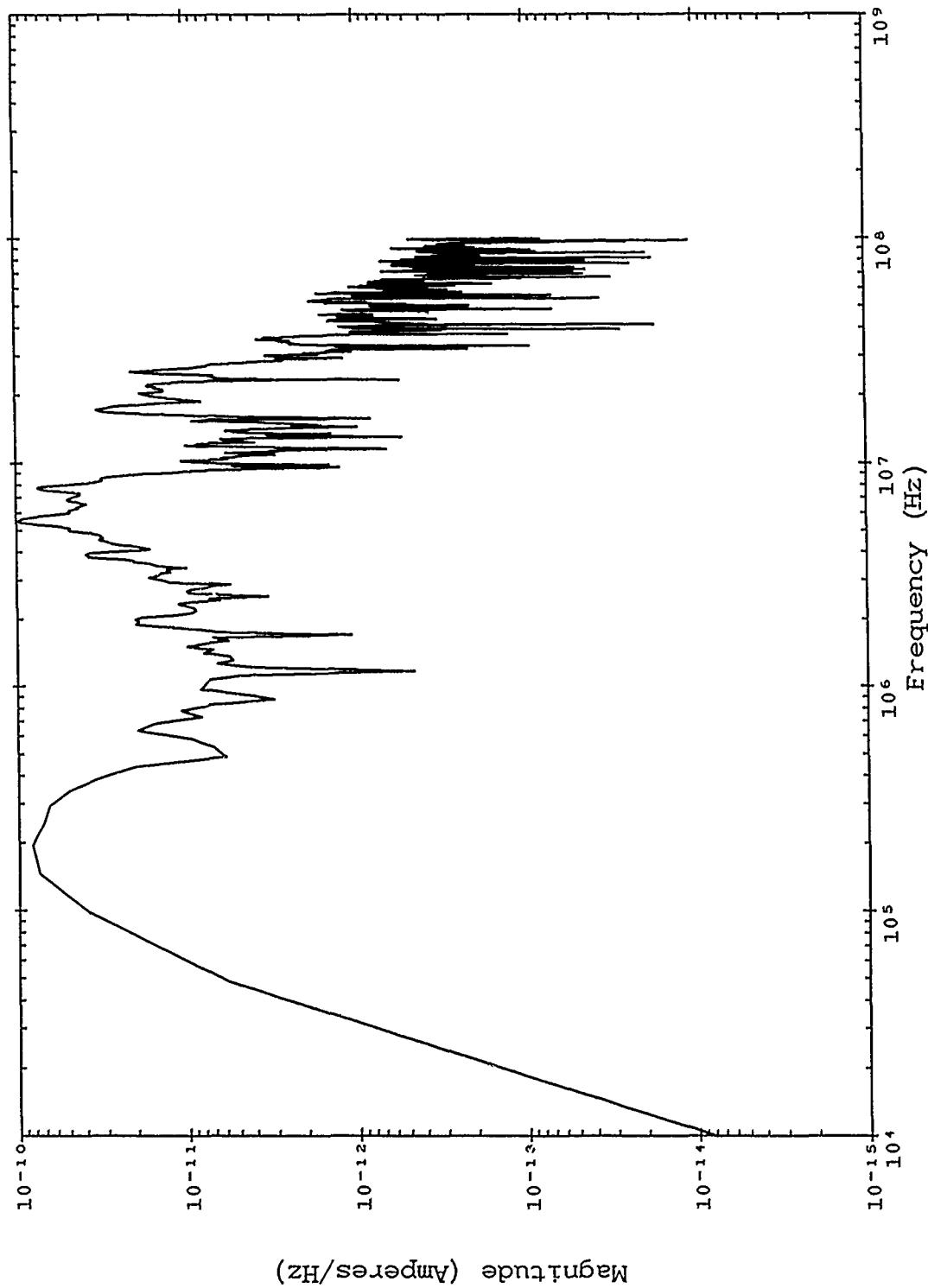


Figure B-265. Corrected TRESTLE data; TP 5524 SN 2584.

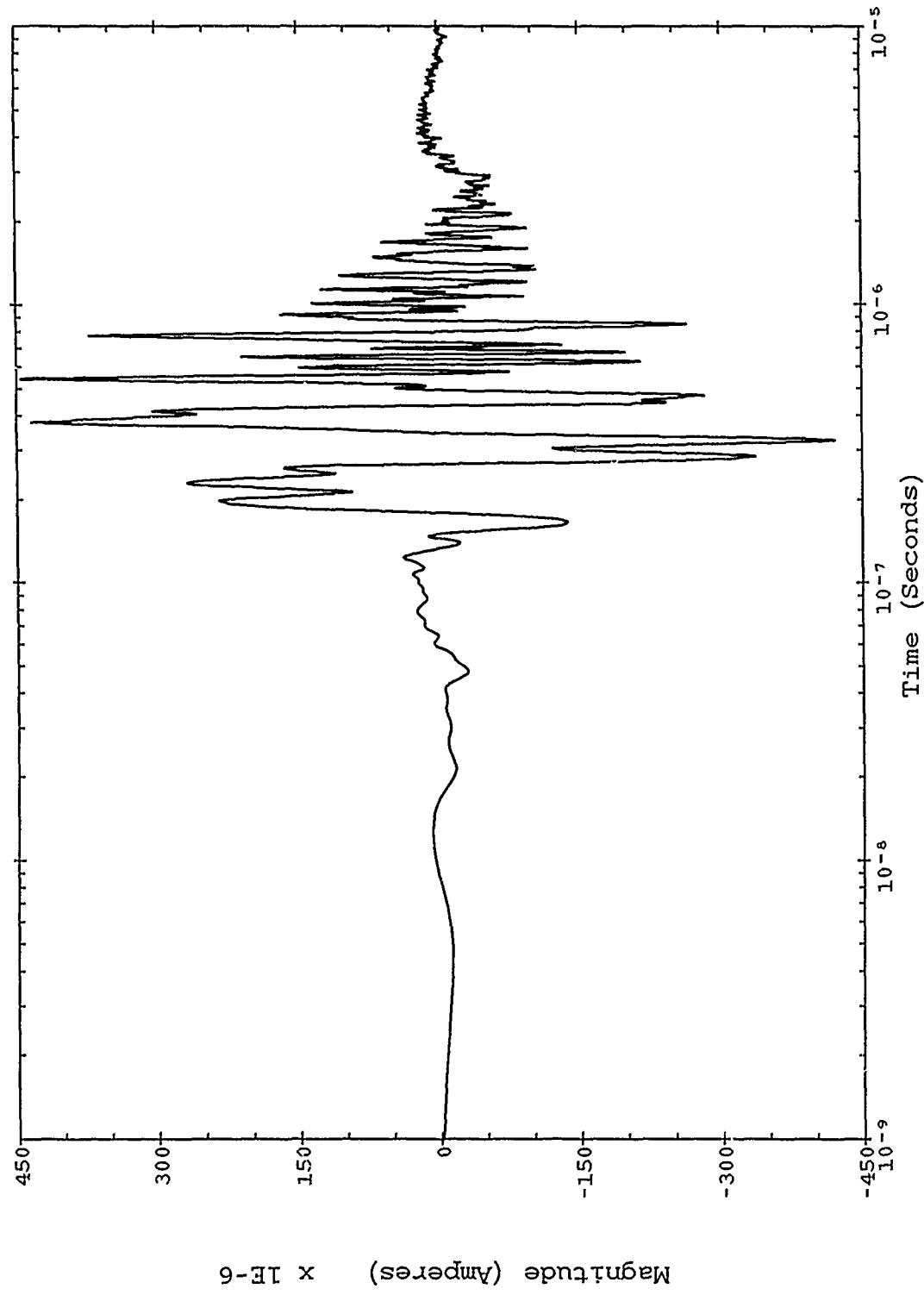


Figure B-266. Corrected TRESTLE data; TP 5524 SN 2584.

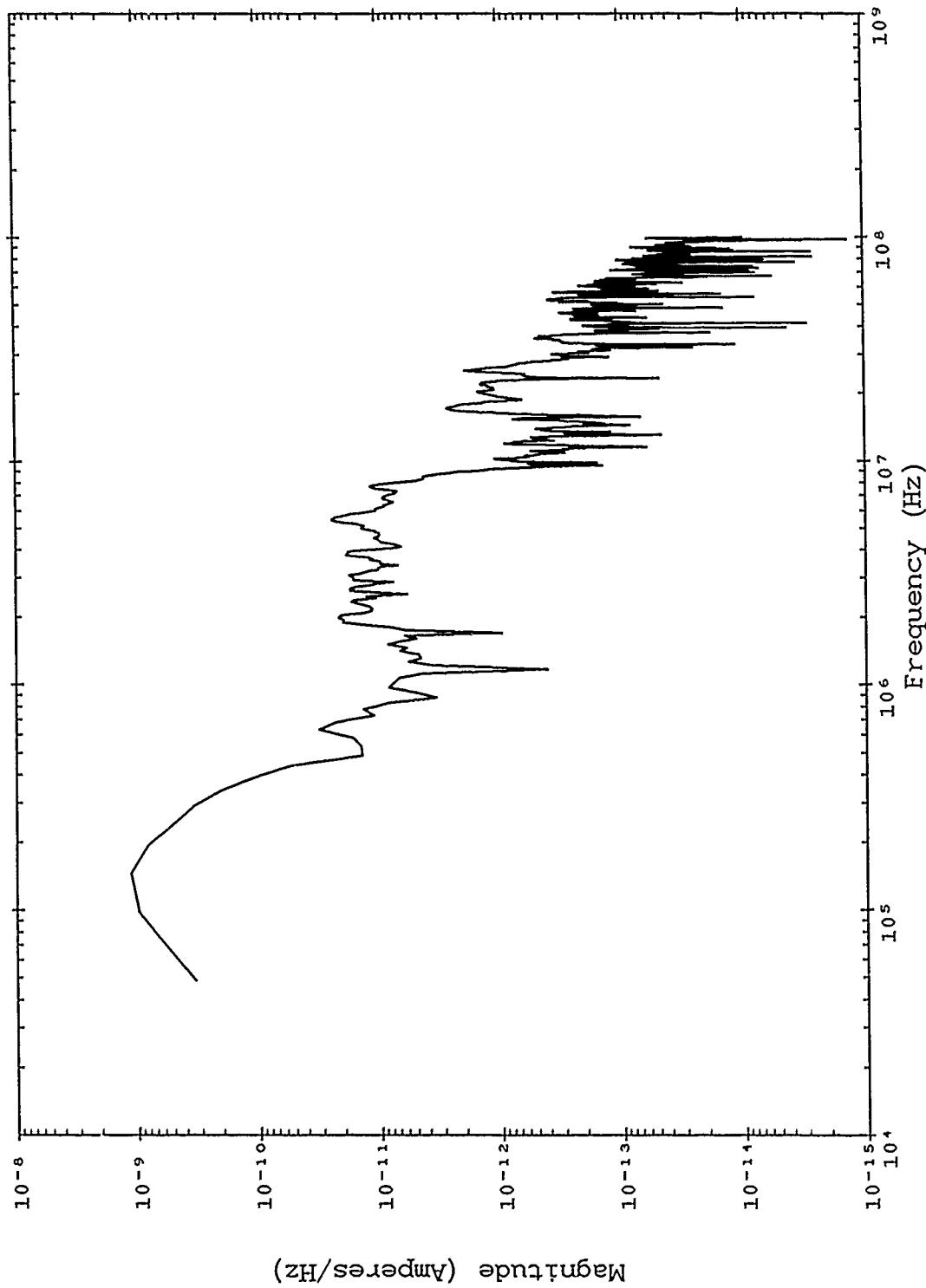


Figure B-267. Severe nearby lightning threat; TP 5524 SN 2584.

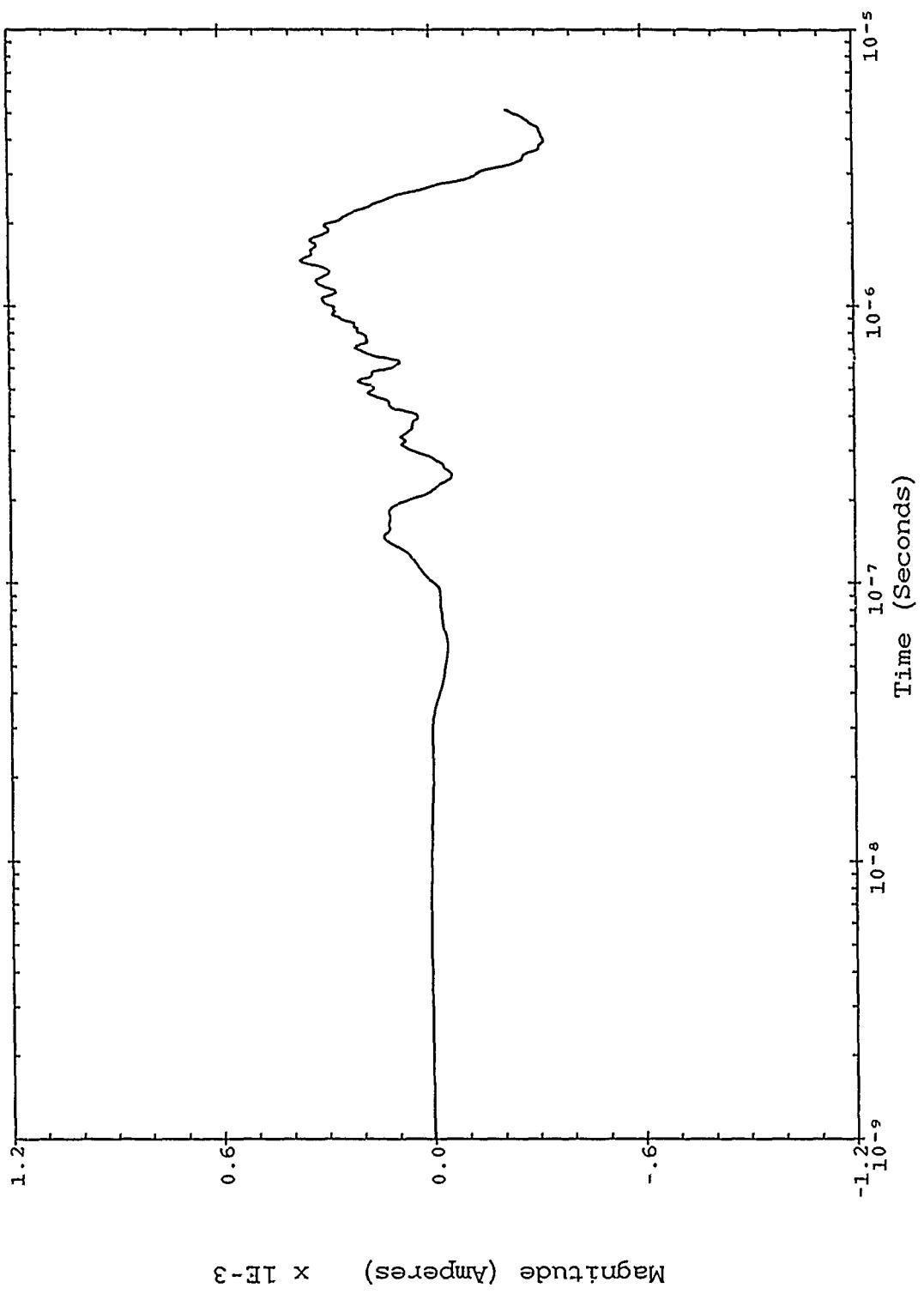


Figure B-268. Severe nearby lightning threat; TP 5524 SN 2584.

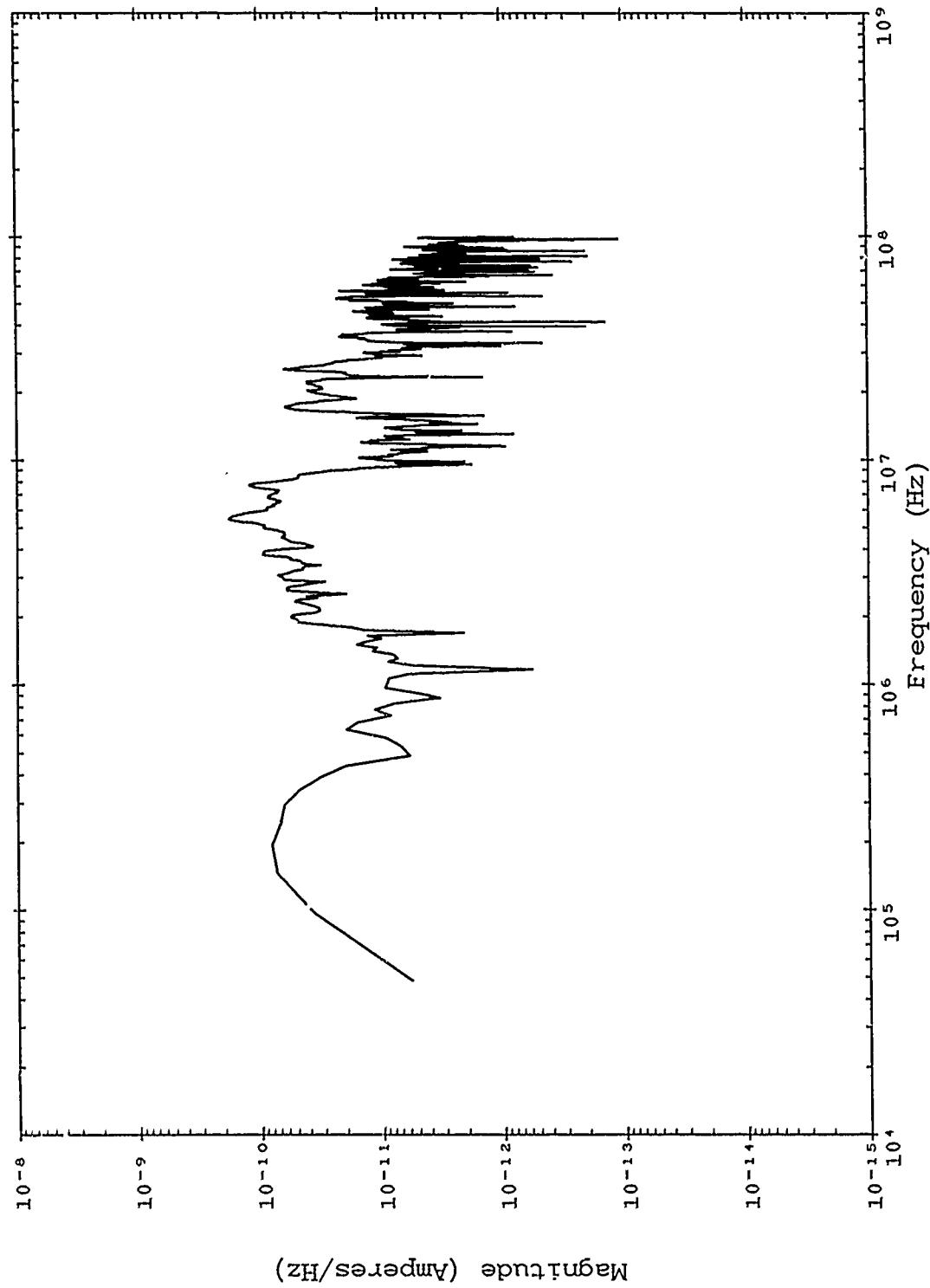


Figure B-269. Double exponential threat; TP 5524 SN 2584.

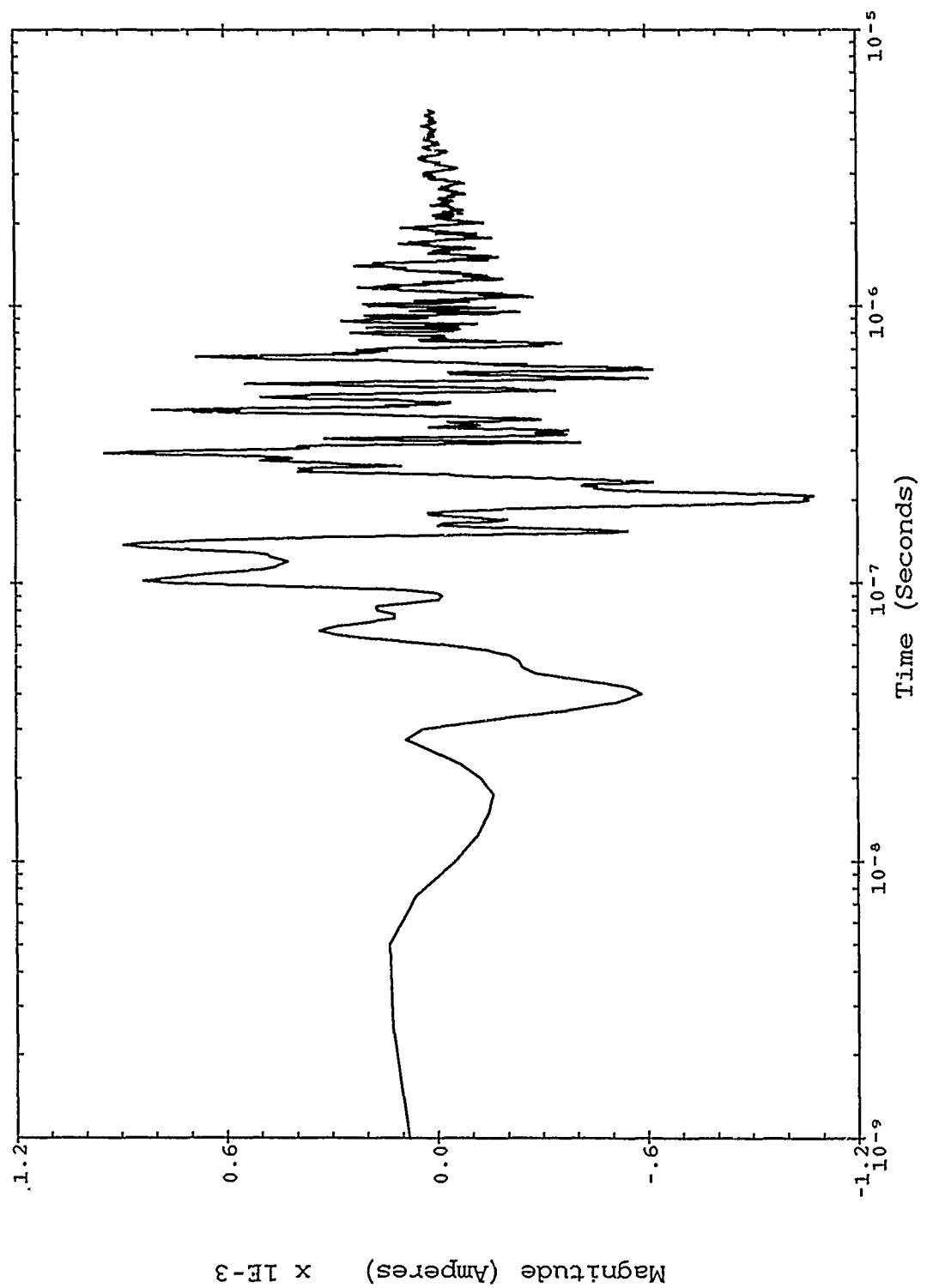


Figure B-270. Double exponential threat; TP 5524 SN 2584.

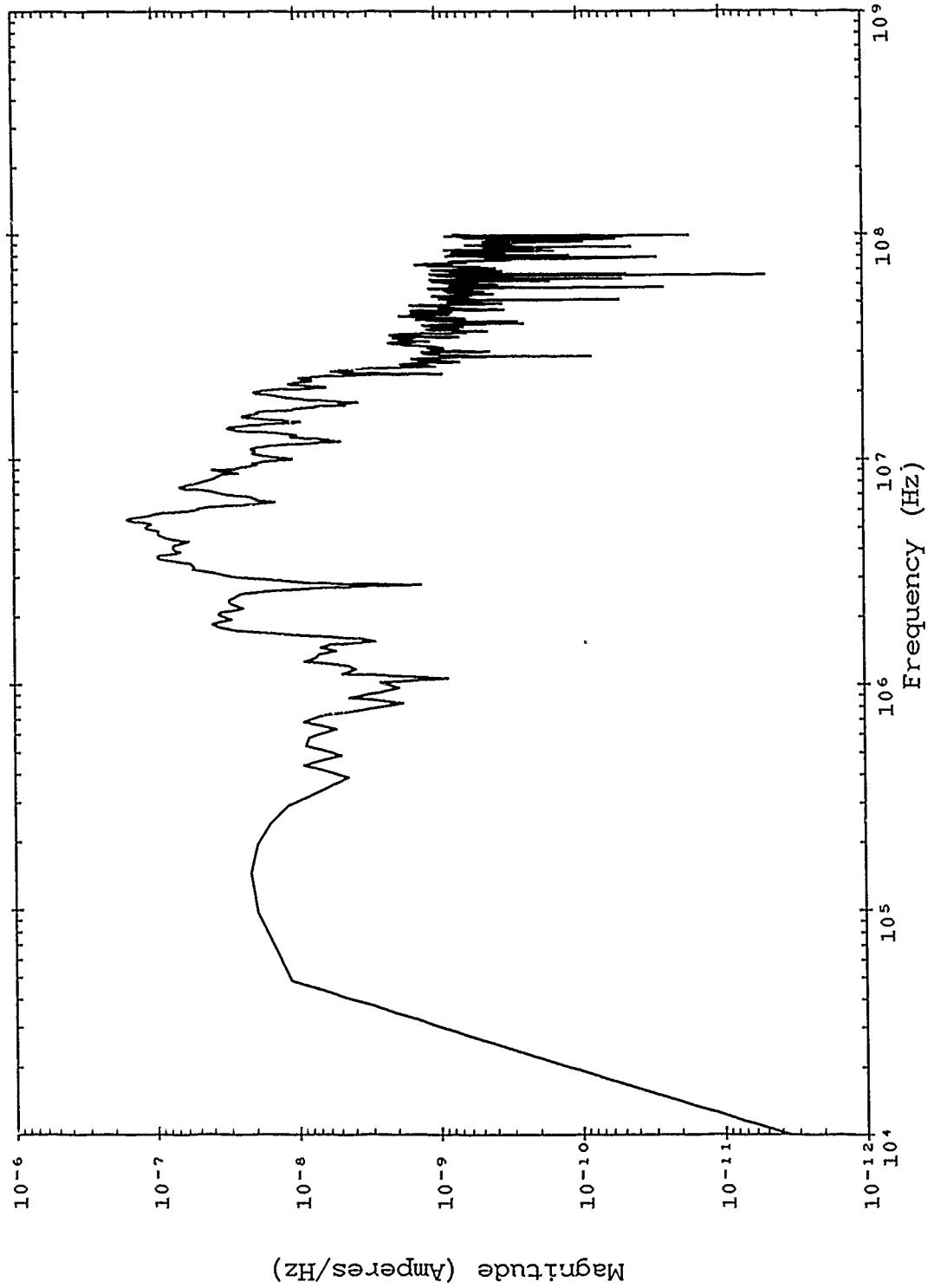


Figure B-271. Corrected TRESTLE data; TP 5584 SN 2687.

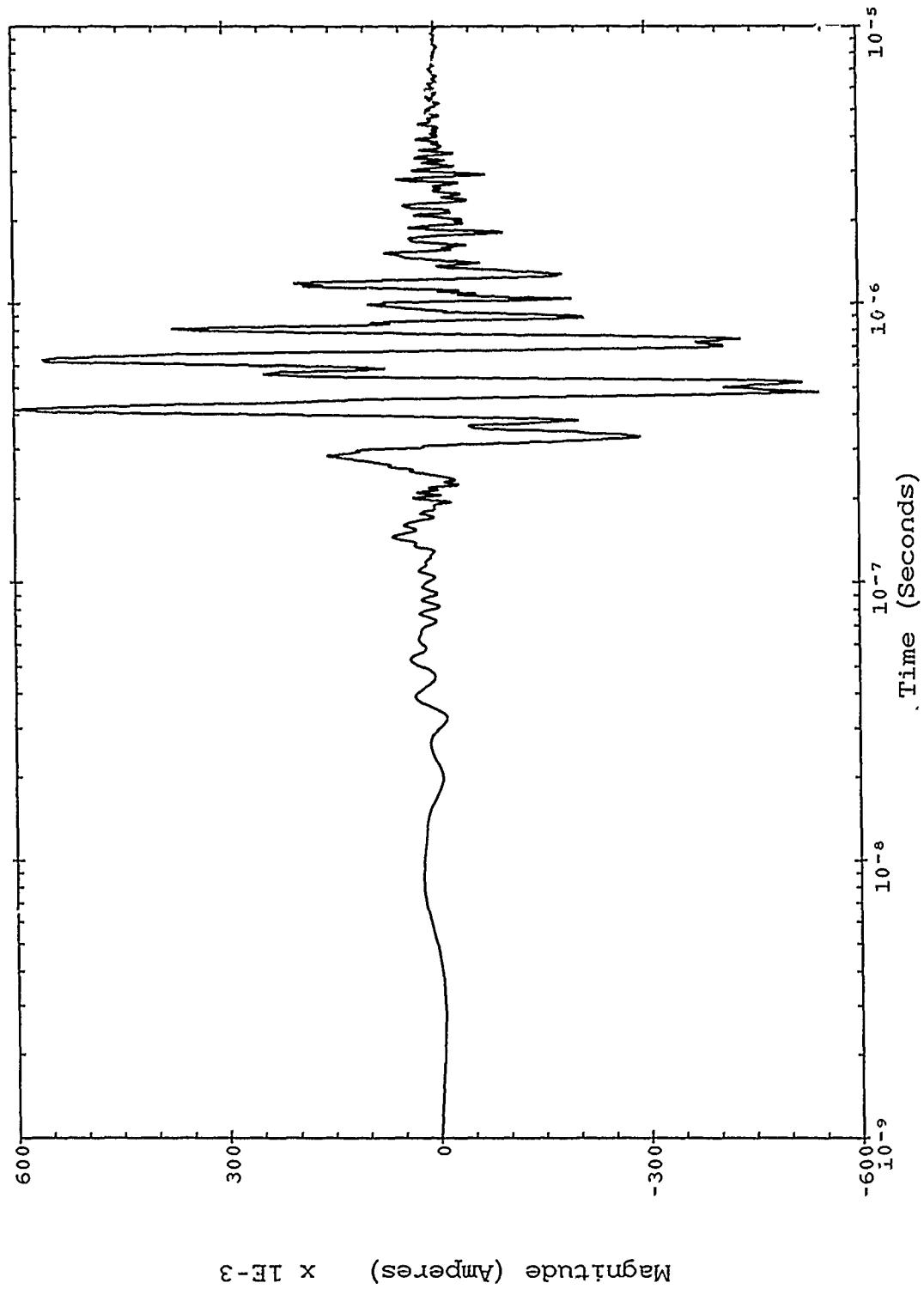


Figure B-272. Corrected TRESTLE data; TP 5584 SN 2687.

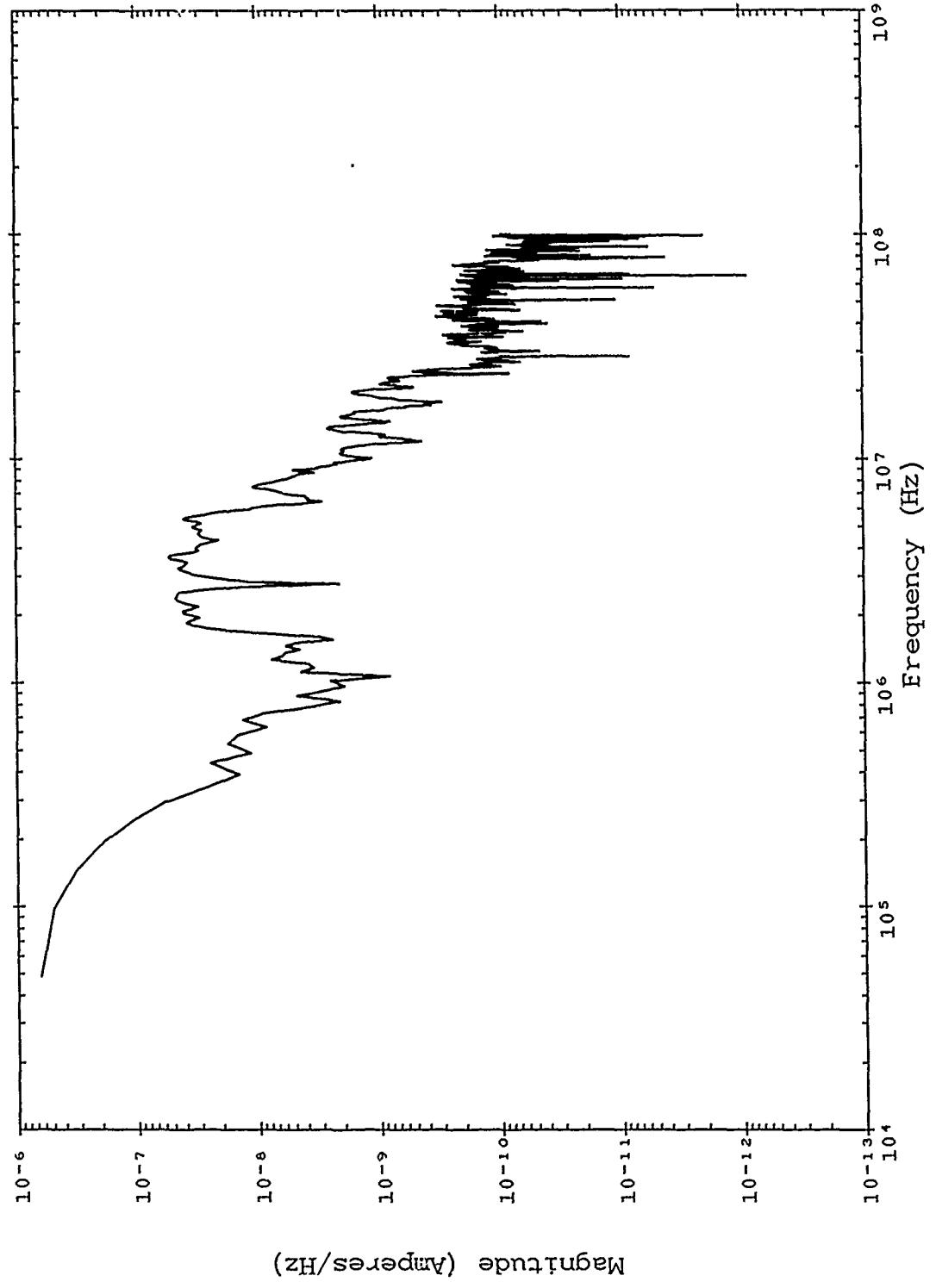


Figure B-273. Severe nearby lightning threat; TP 5584 SN 2687.

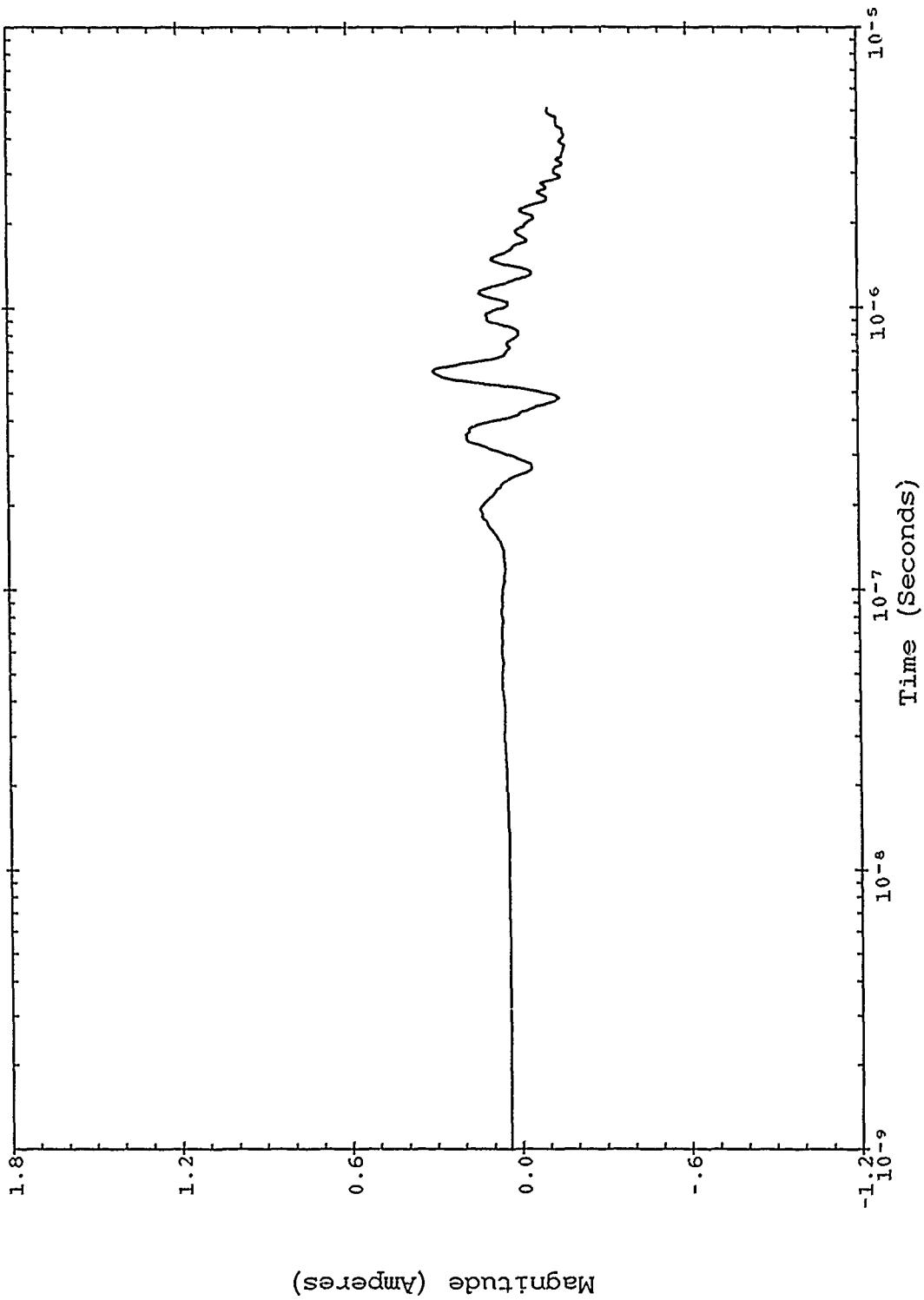


Figure B-274. Severe nearby lightning threat; TP 5584 SN 2687.

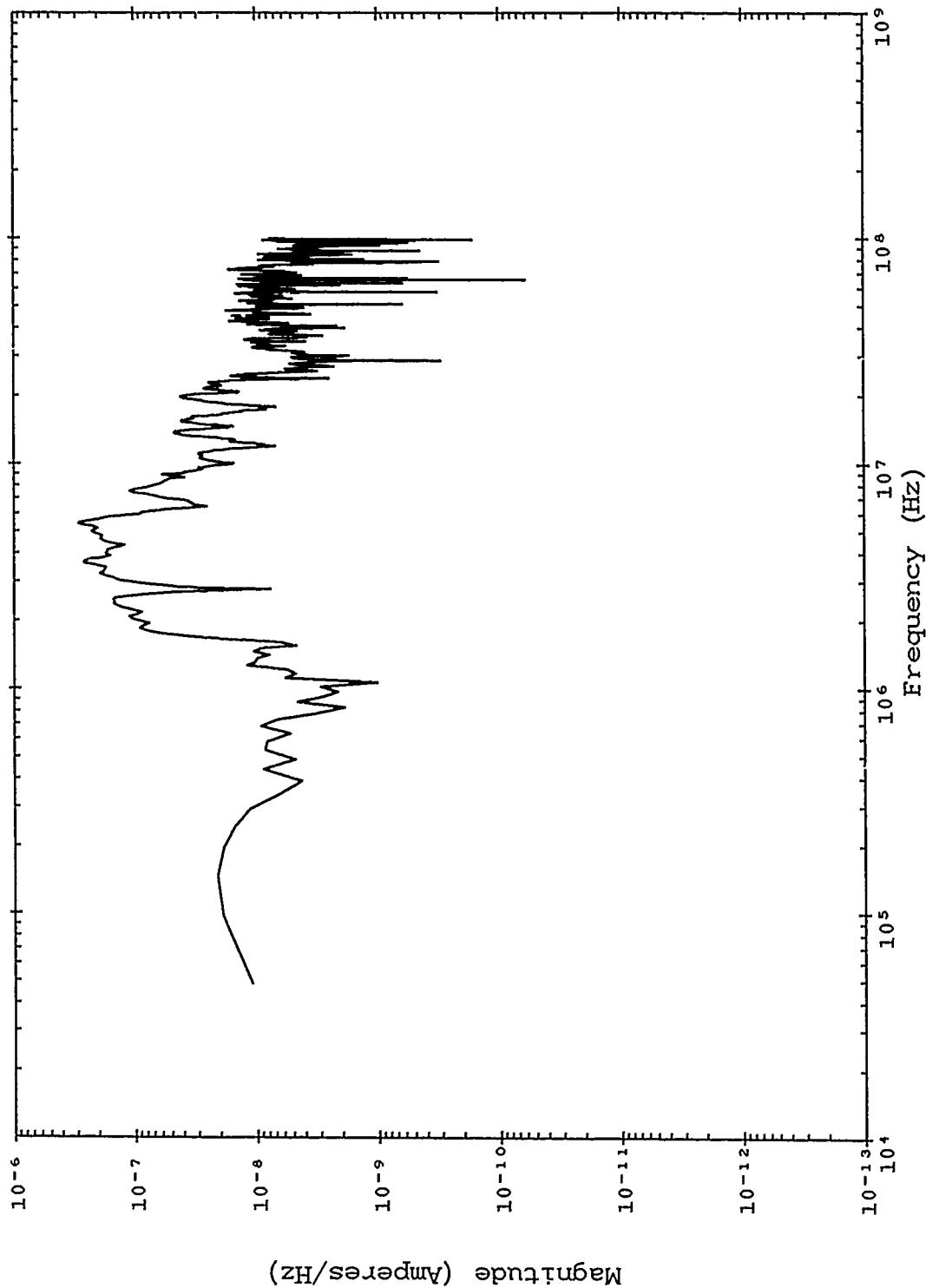


Figure B-275. Double exponential threat; TP 5584 SN 2687.

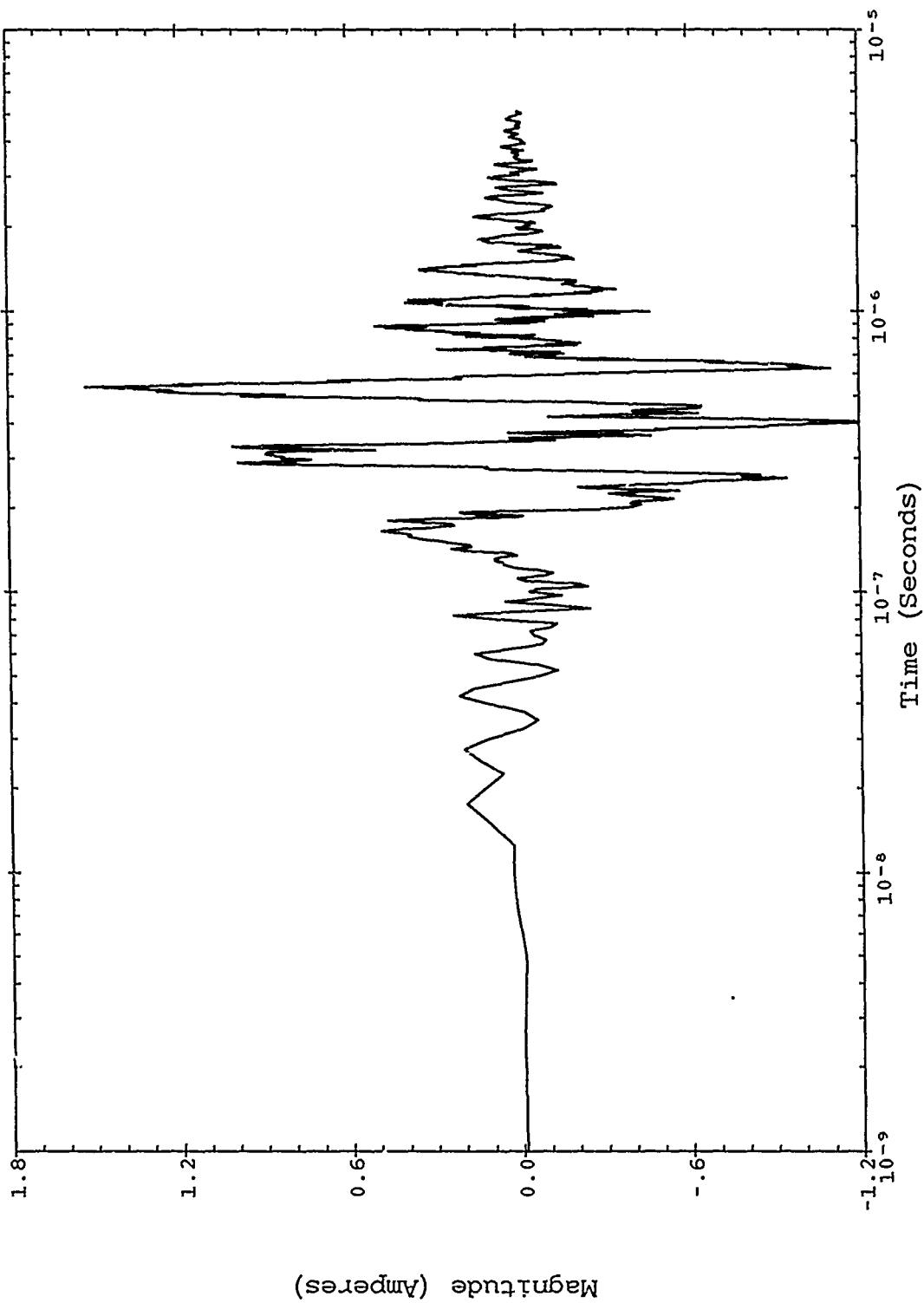


Figure B-276. Double exponential transient; TP 5584 SN 2687.

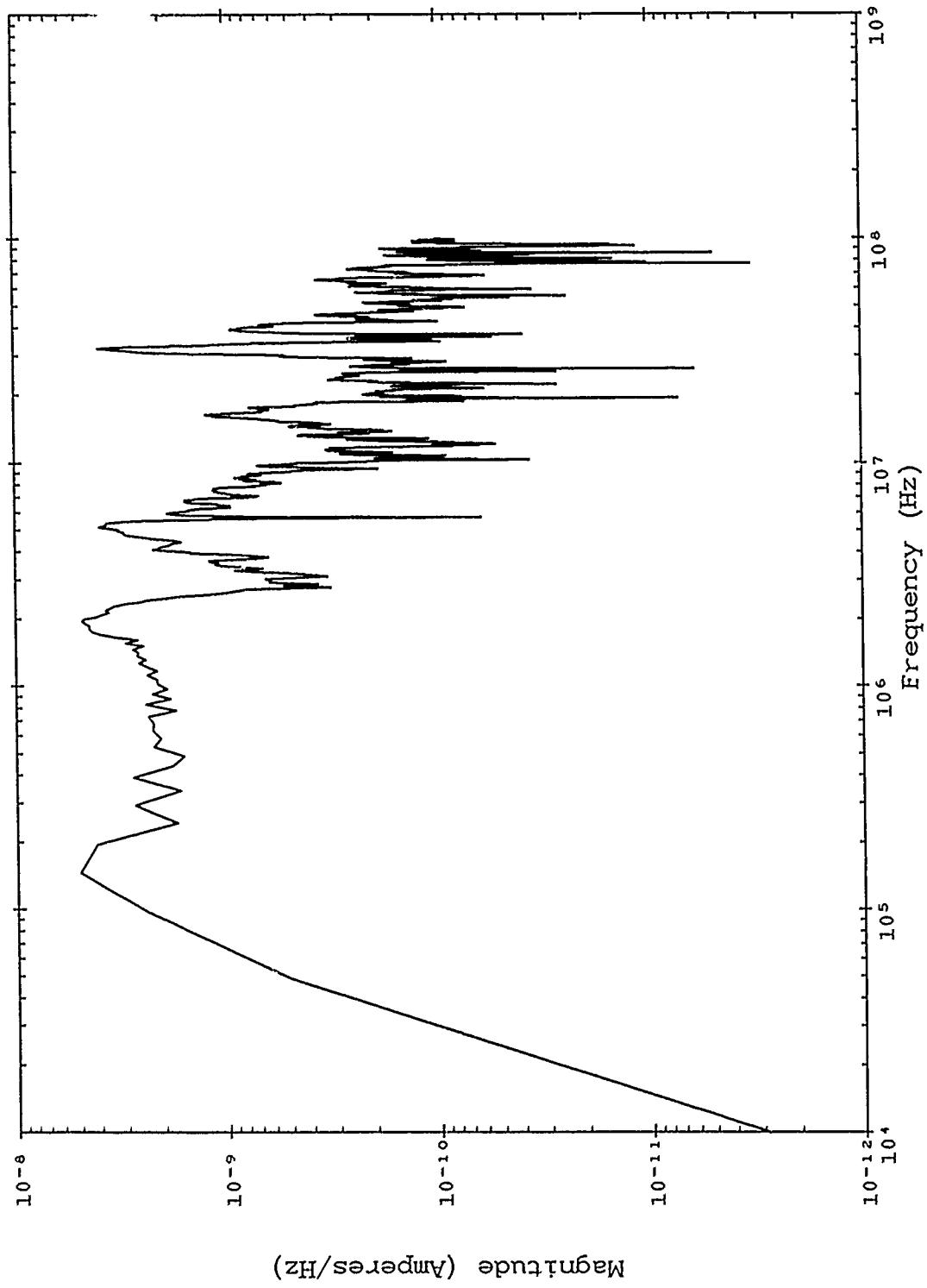


Figure B-277. Corrected TRESTLE data; TP 5611 SN 2308.

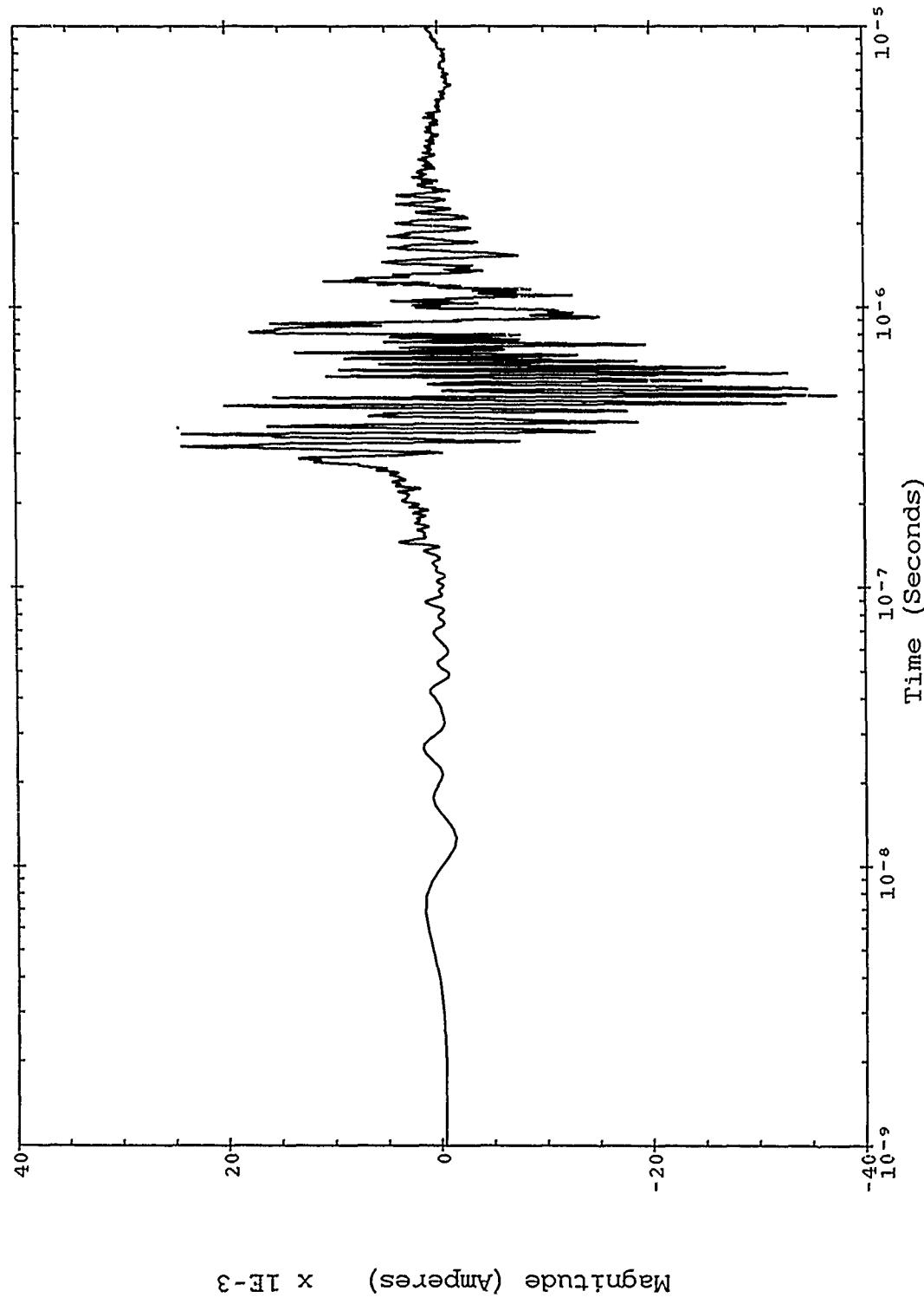


Figure B-278. Corrected TRESTLE data; TP 5611 SN 2308.

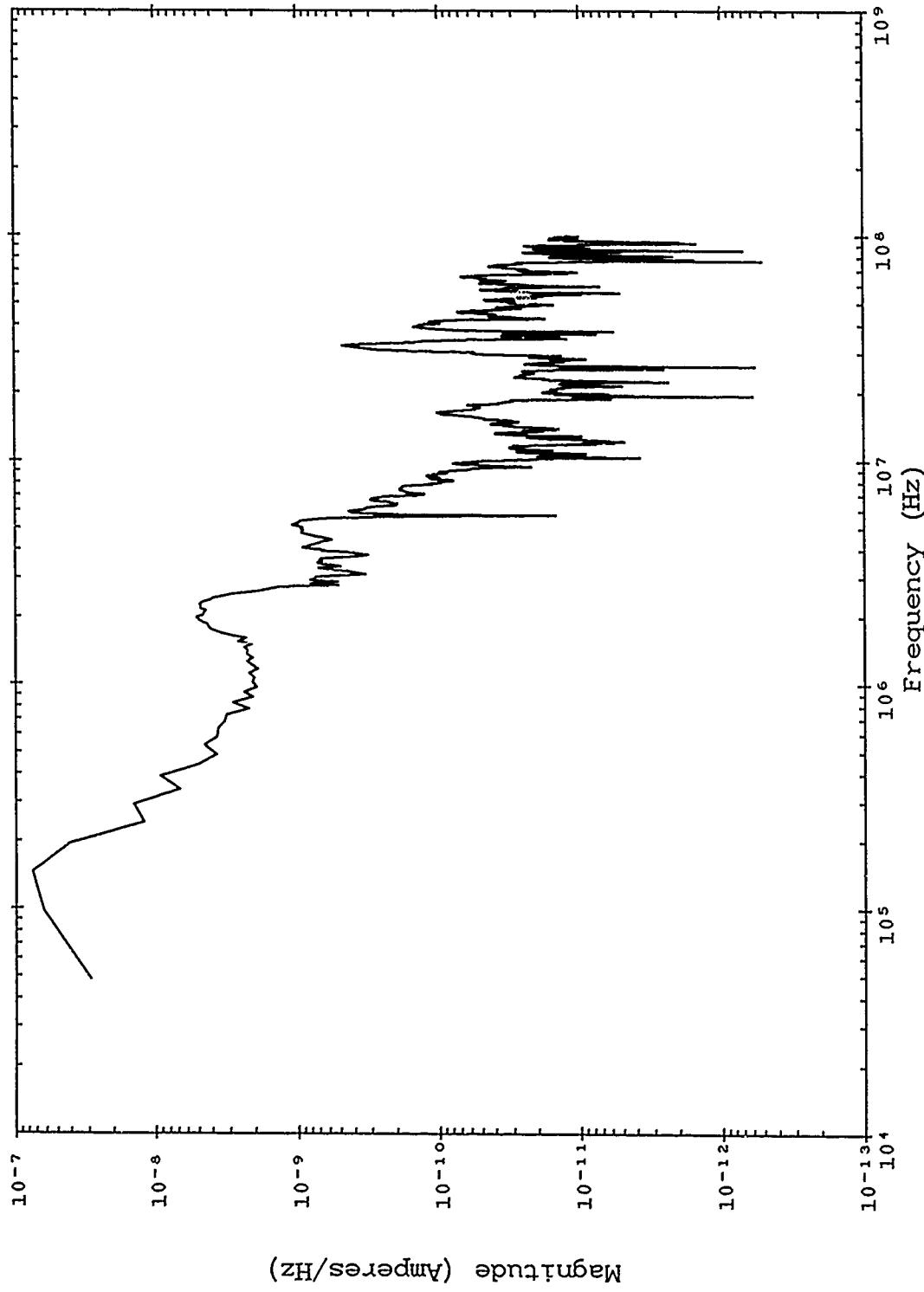


Figure B-279. Severe nearby lightning threat; TP 5611 SN 2308.

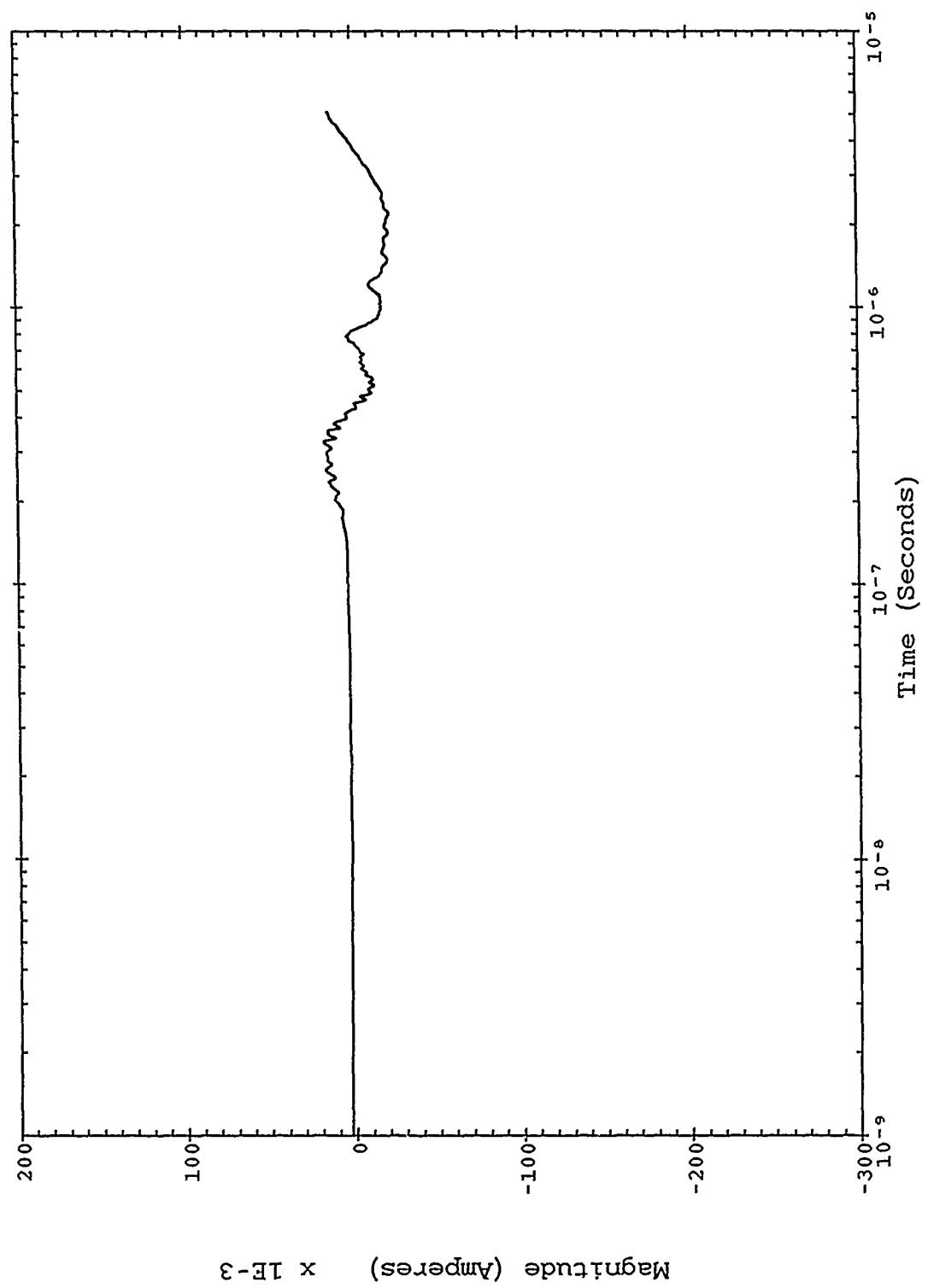


Figure B-280. Severe nearby lightning threat; TP 5611 SN 2308.

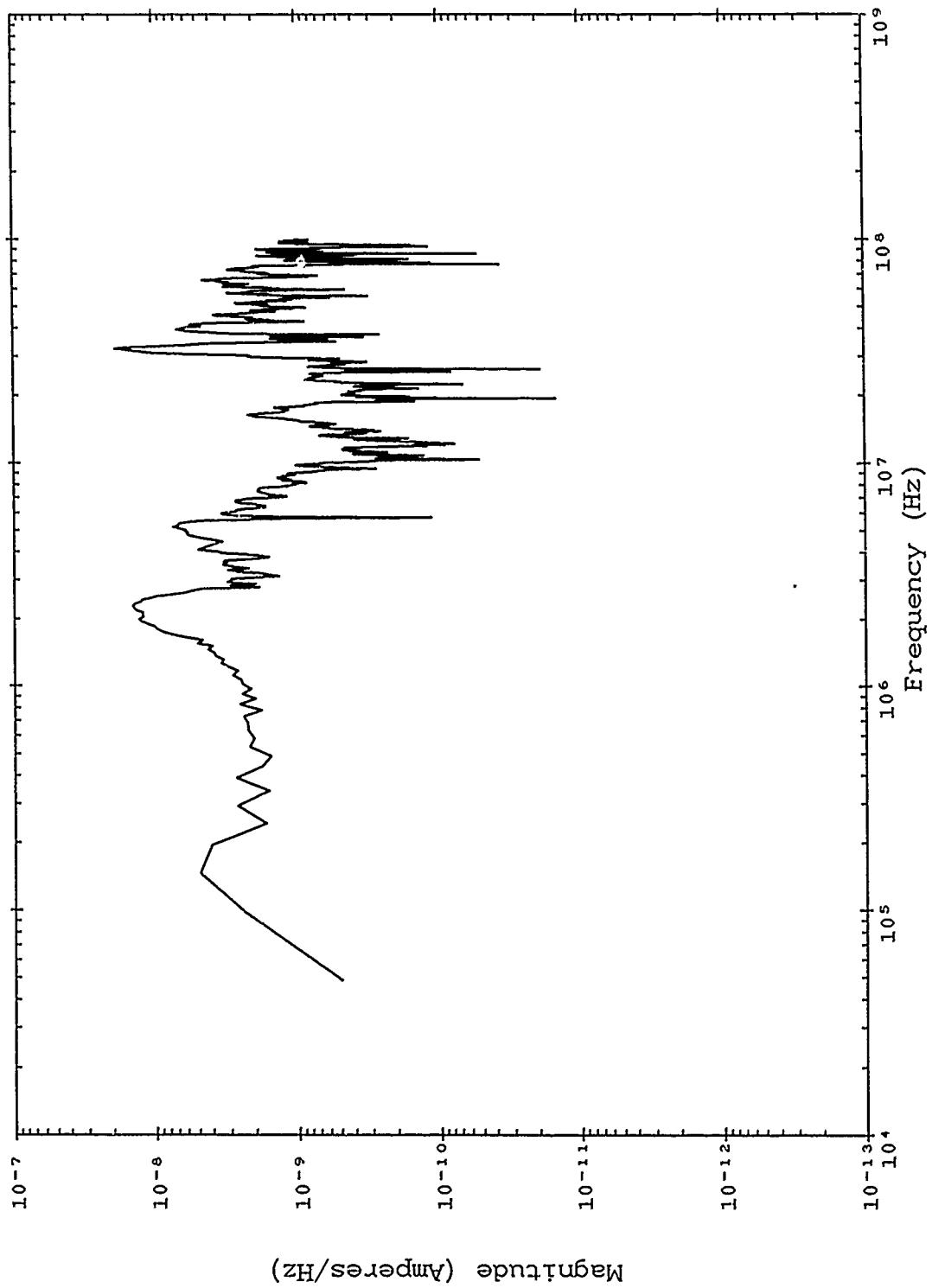


Figure B-281. Double exponential threat; TP 5611 SN 2308.

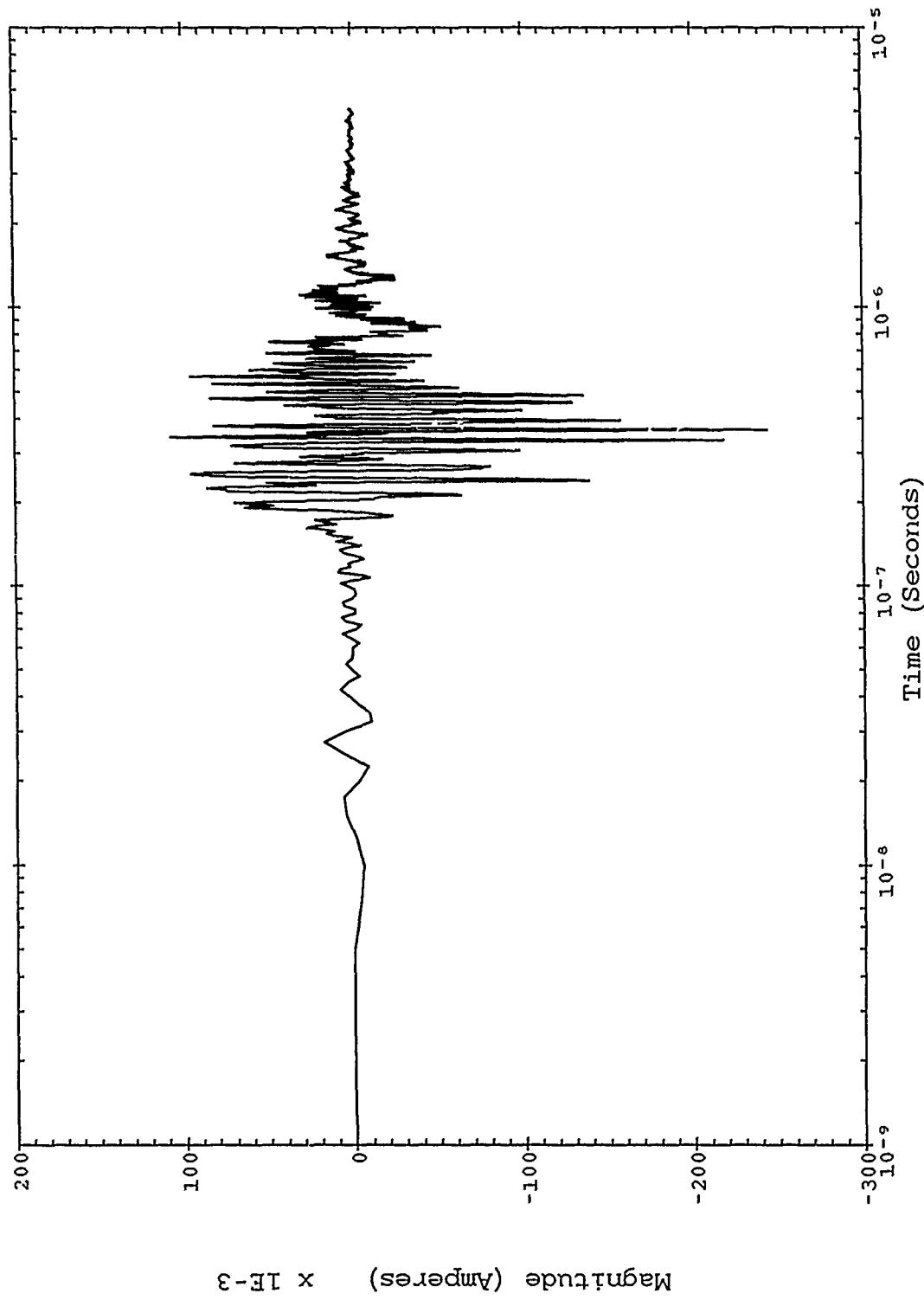


Figure B-282. Double exponential threat; TP 5611 SN 2308.

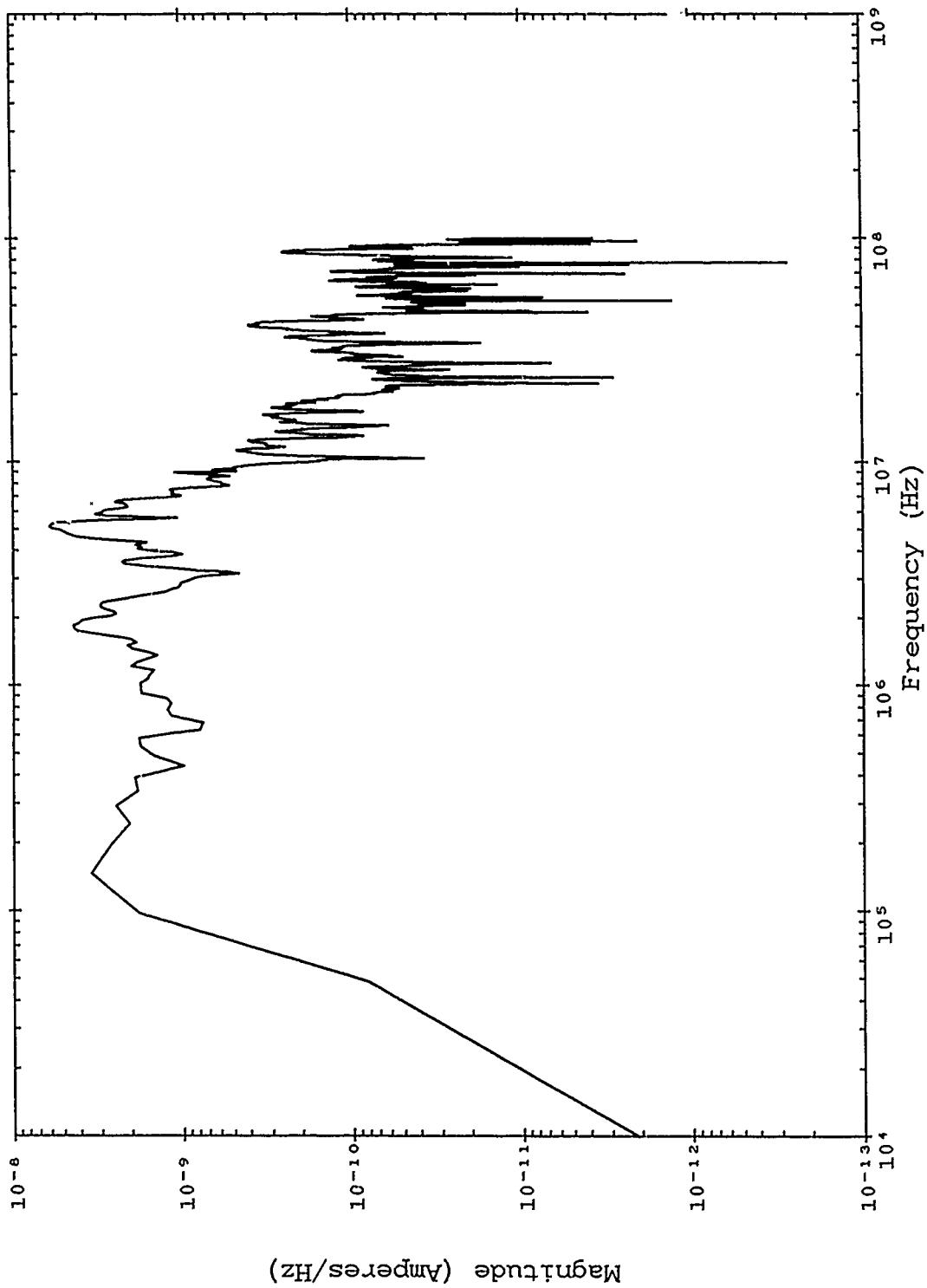


Figure B-283. Corrected TRESTLE data; TP 5611 SN 2501.

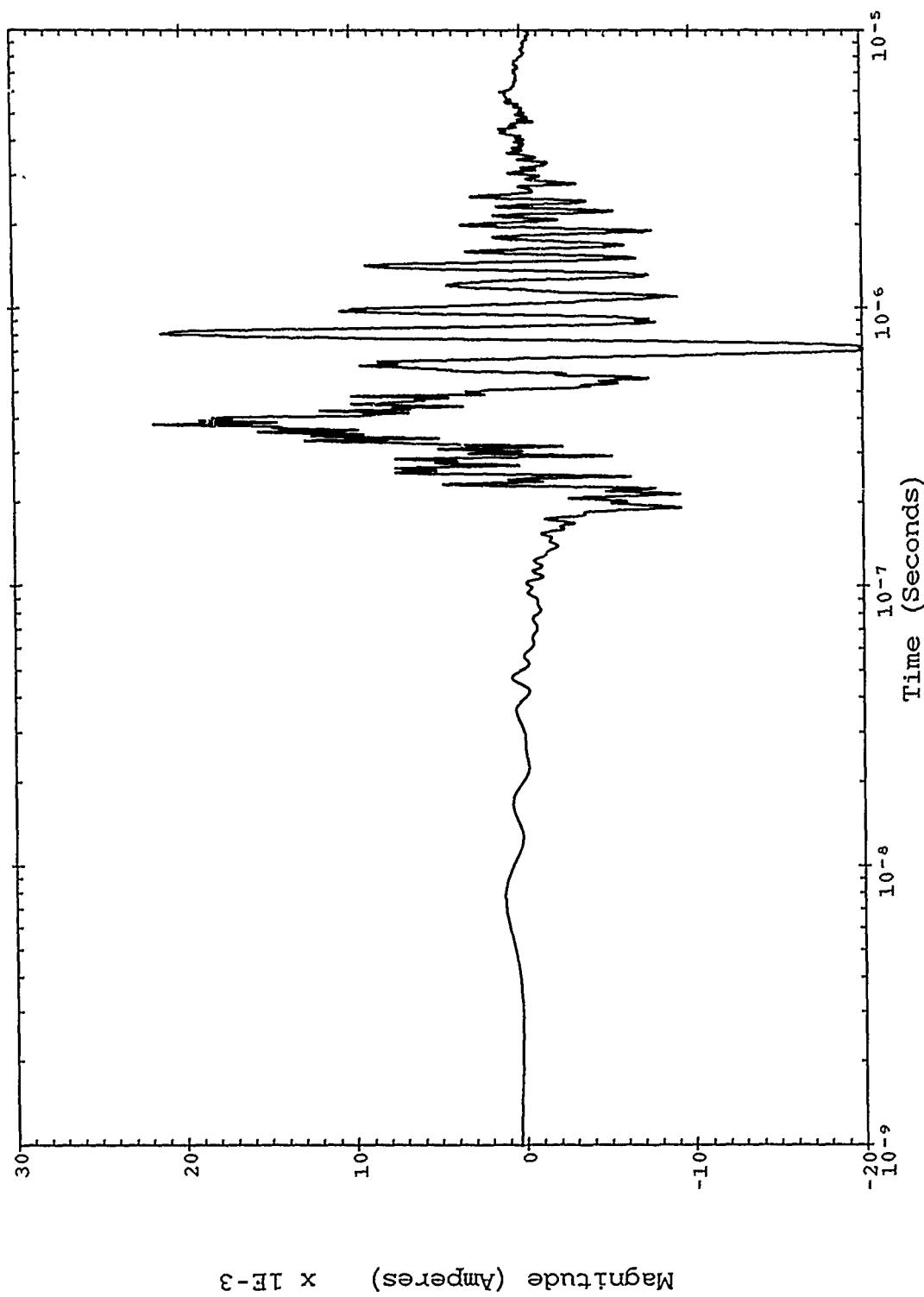


Figure B-284. Corrected TRESTLE data; TP 5611 SN 2501.

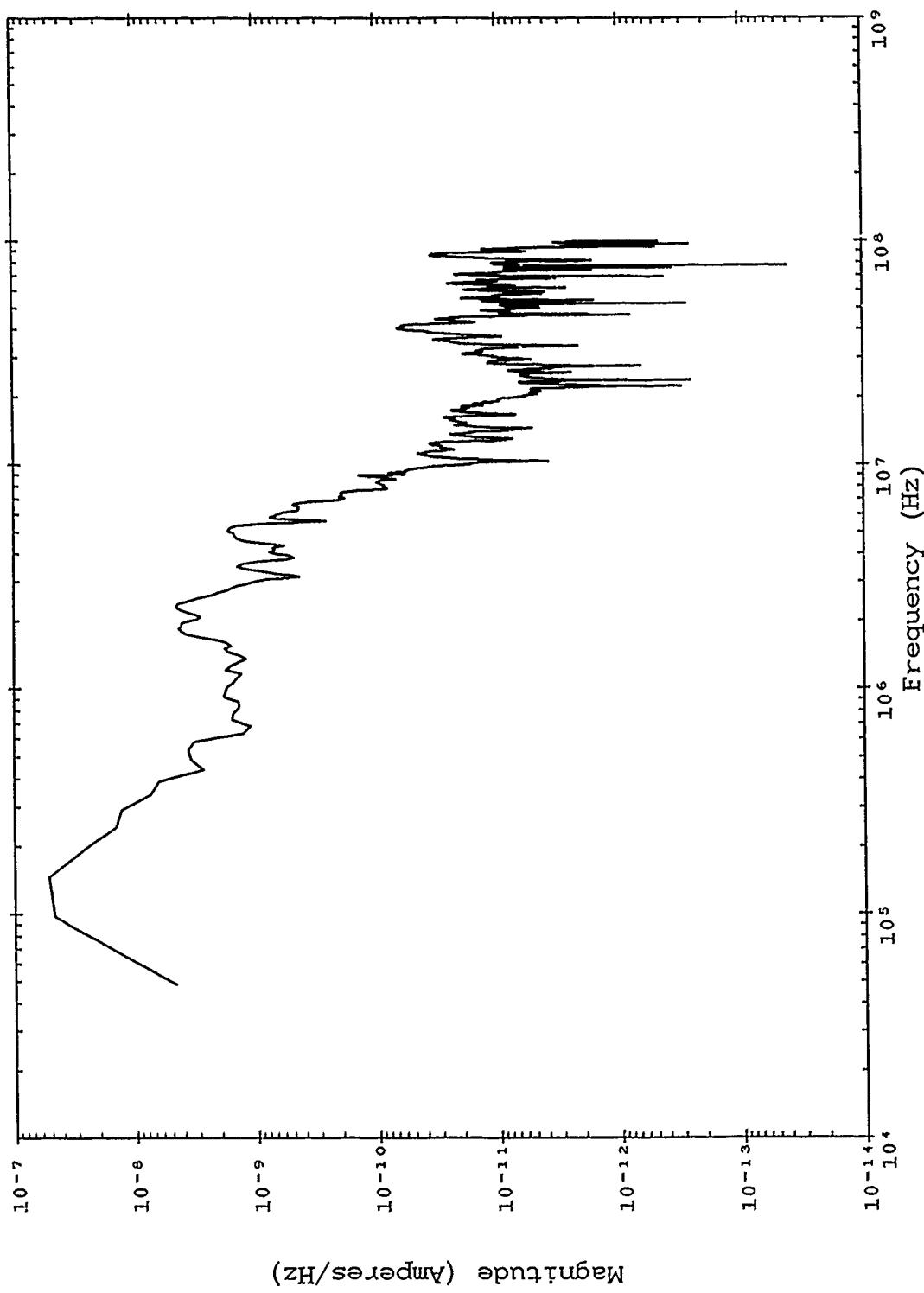


Figure B-285. Severe nearby lightning threat; TP 5611 SN 2501.

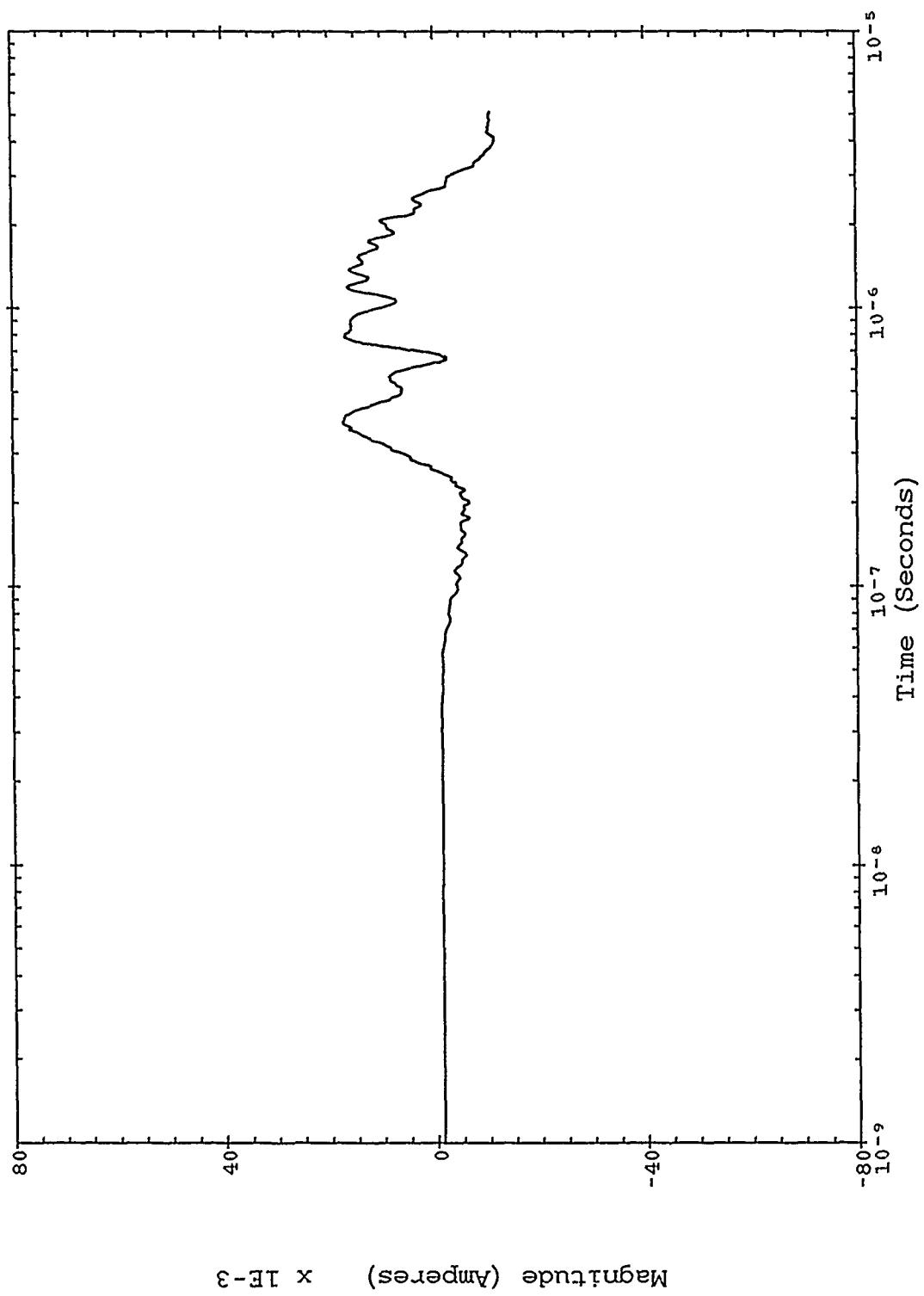


Figure B-286. Severe nearby lightning threat; TP 5611 SN 2501.

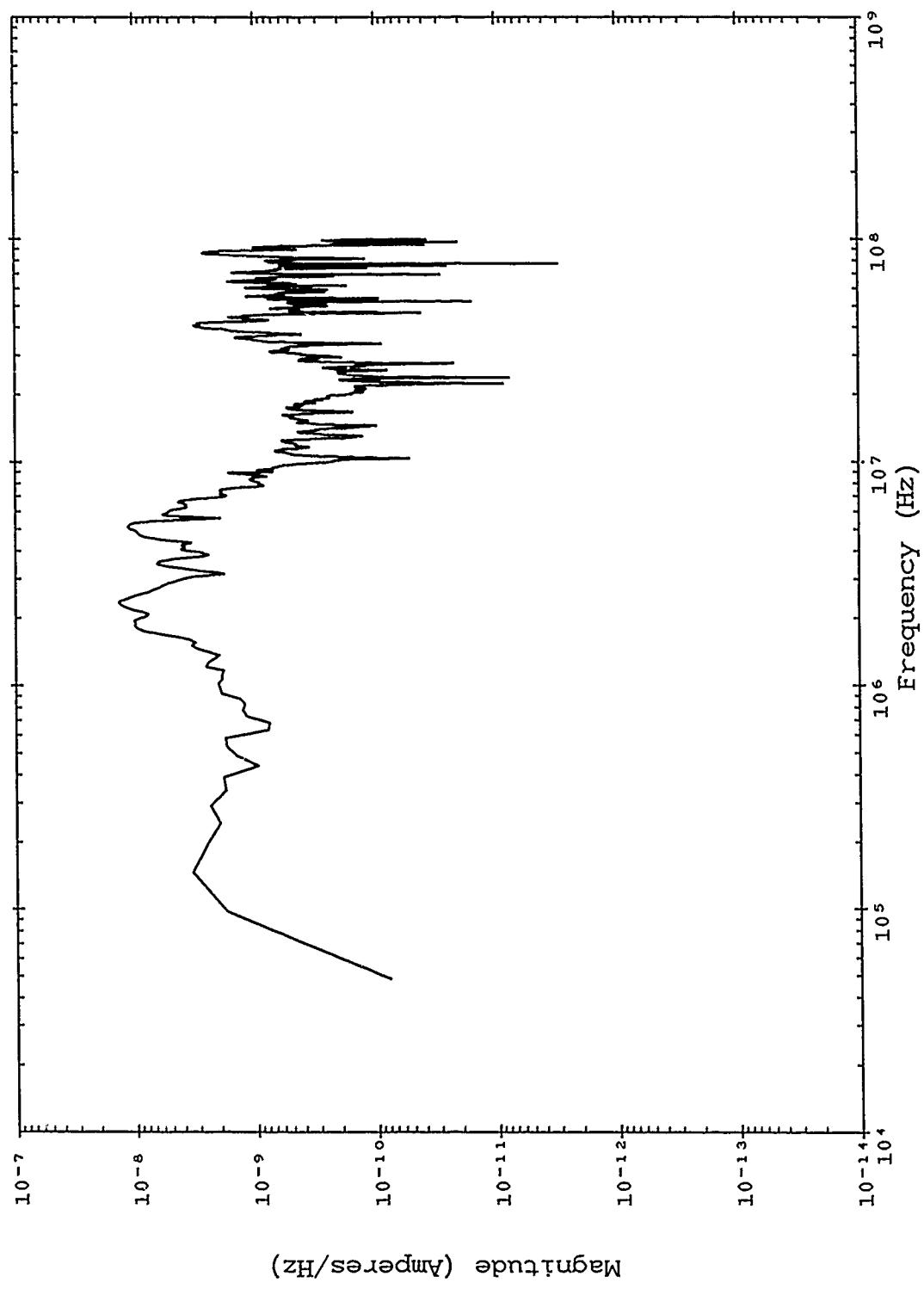


Figure B-287. Double exponential threat; TP 5611 SN 2501.

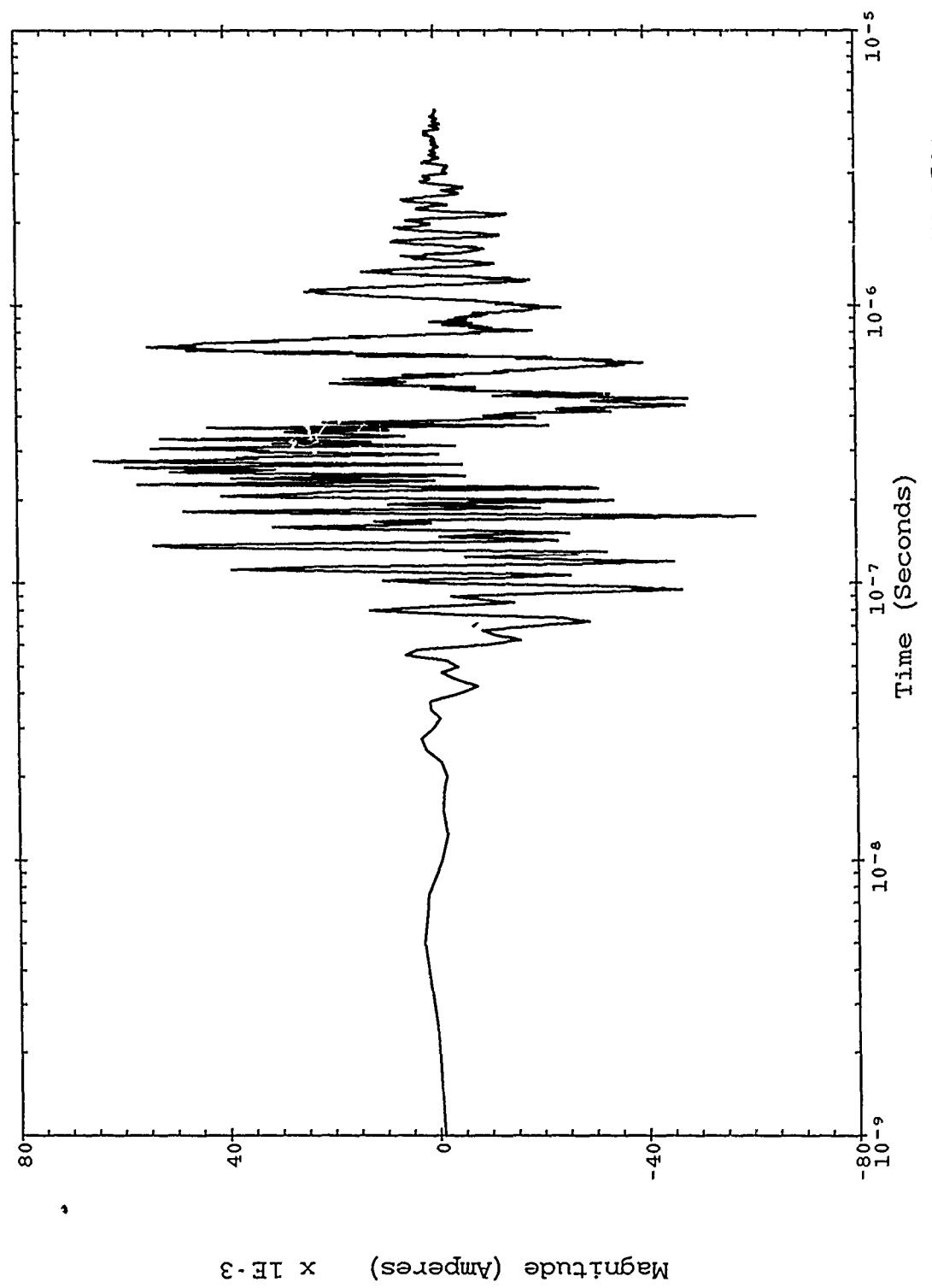


Figure B-288. Double exponential threat; TP 5611 SN 2501.

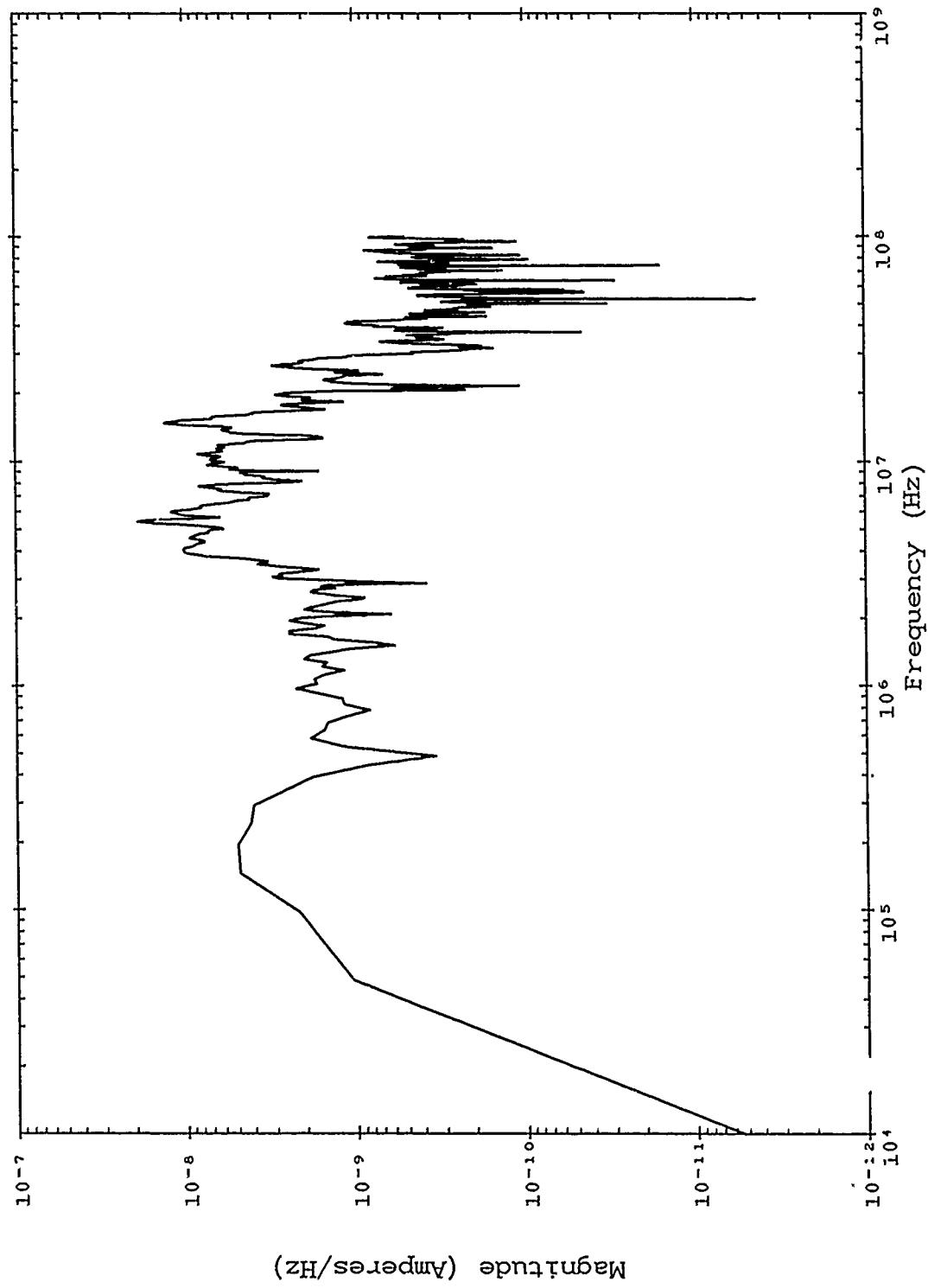


Figure B-289. Corrected TRESTLE data; TP 5727 SN 1180.

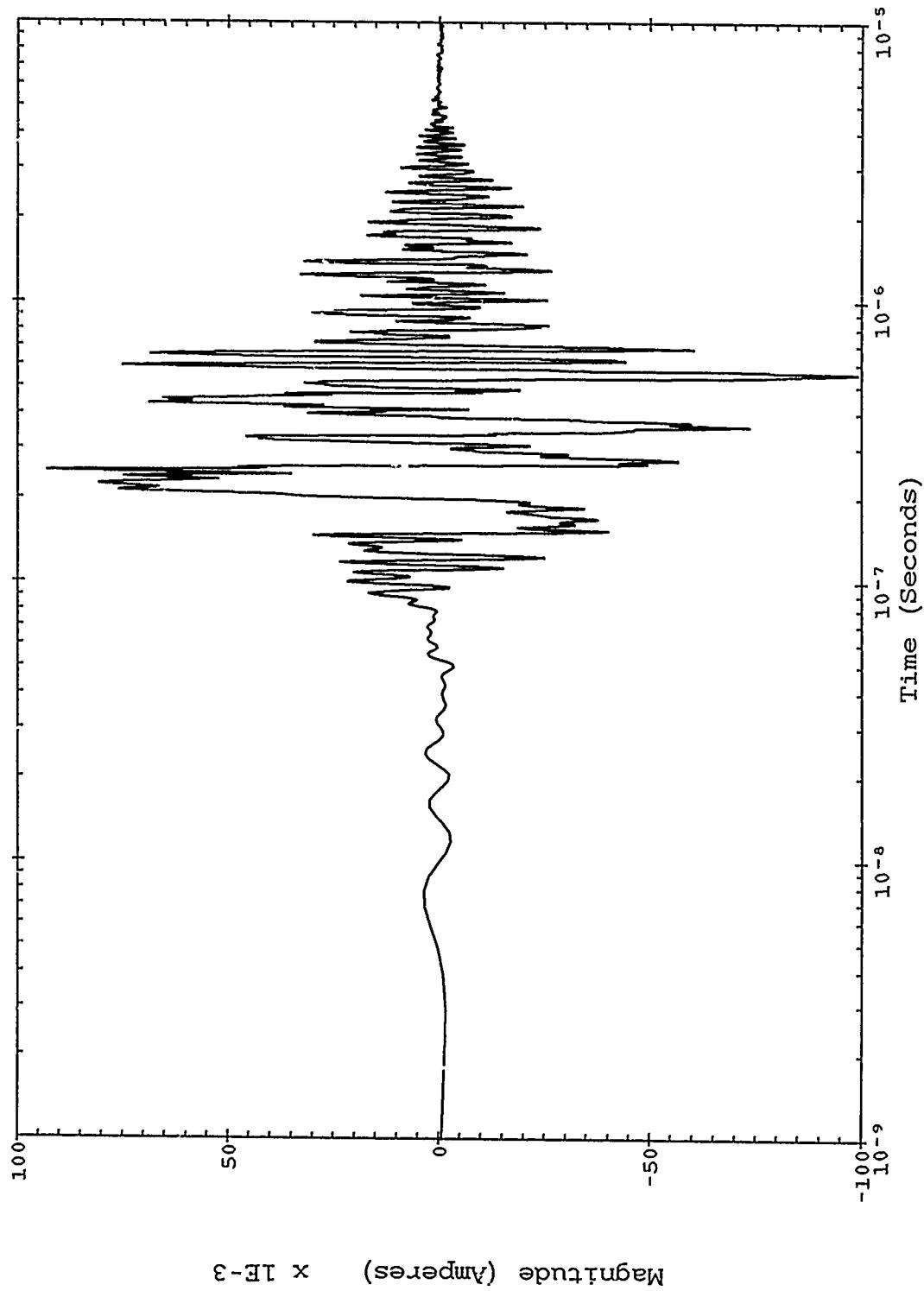


Figure B-290. Corrected TRESTLE data; TP 5727 SN 1180.

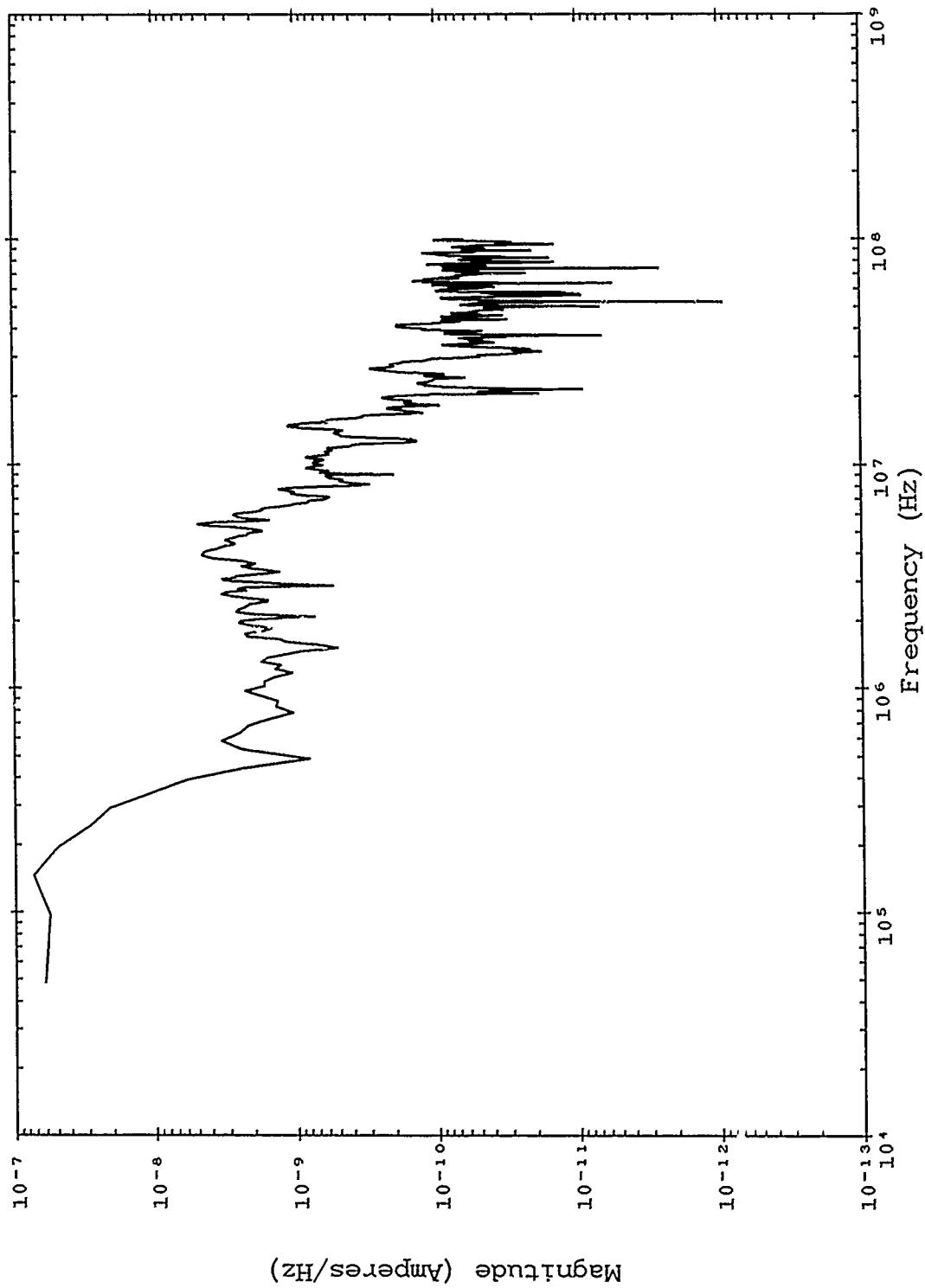


Figure B-291. Severe nearby lightning threat; TP 5727 SN 1180.

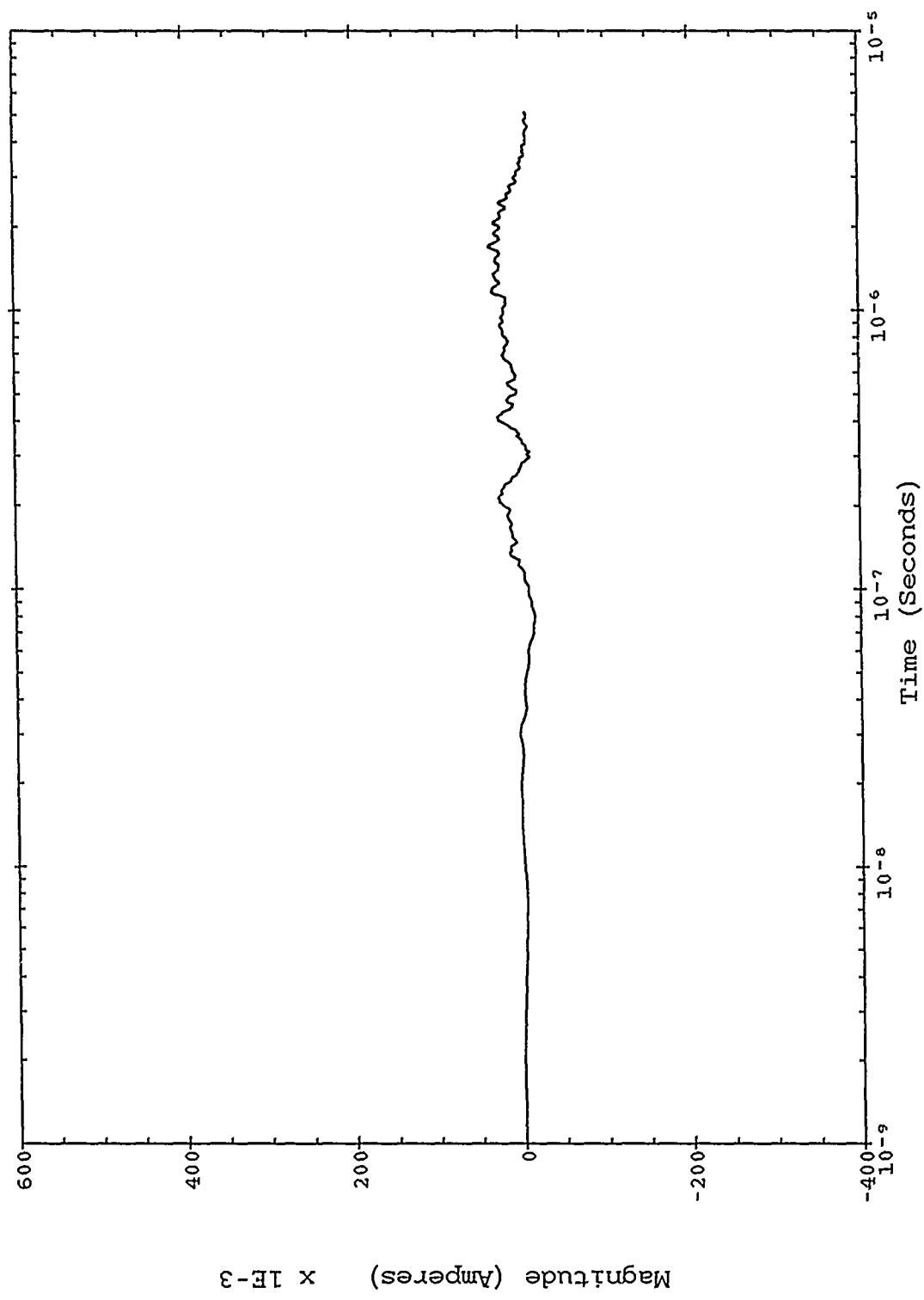


Figure B-292. Severe nearby lightning threat; TP 5727 SN 1180.

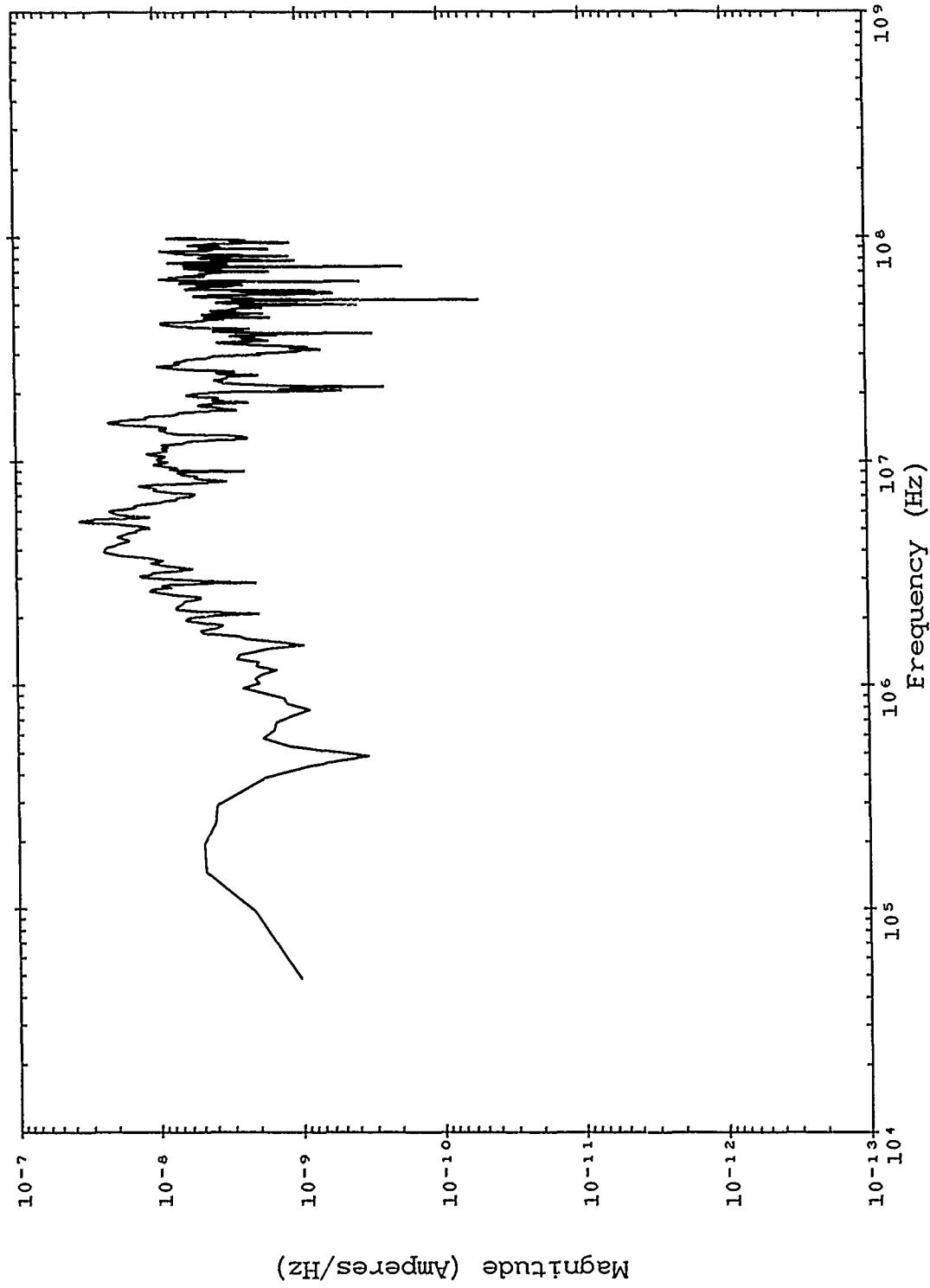


Figure B-293. Double exponential threat; TP 5727 SN 1180.

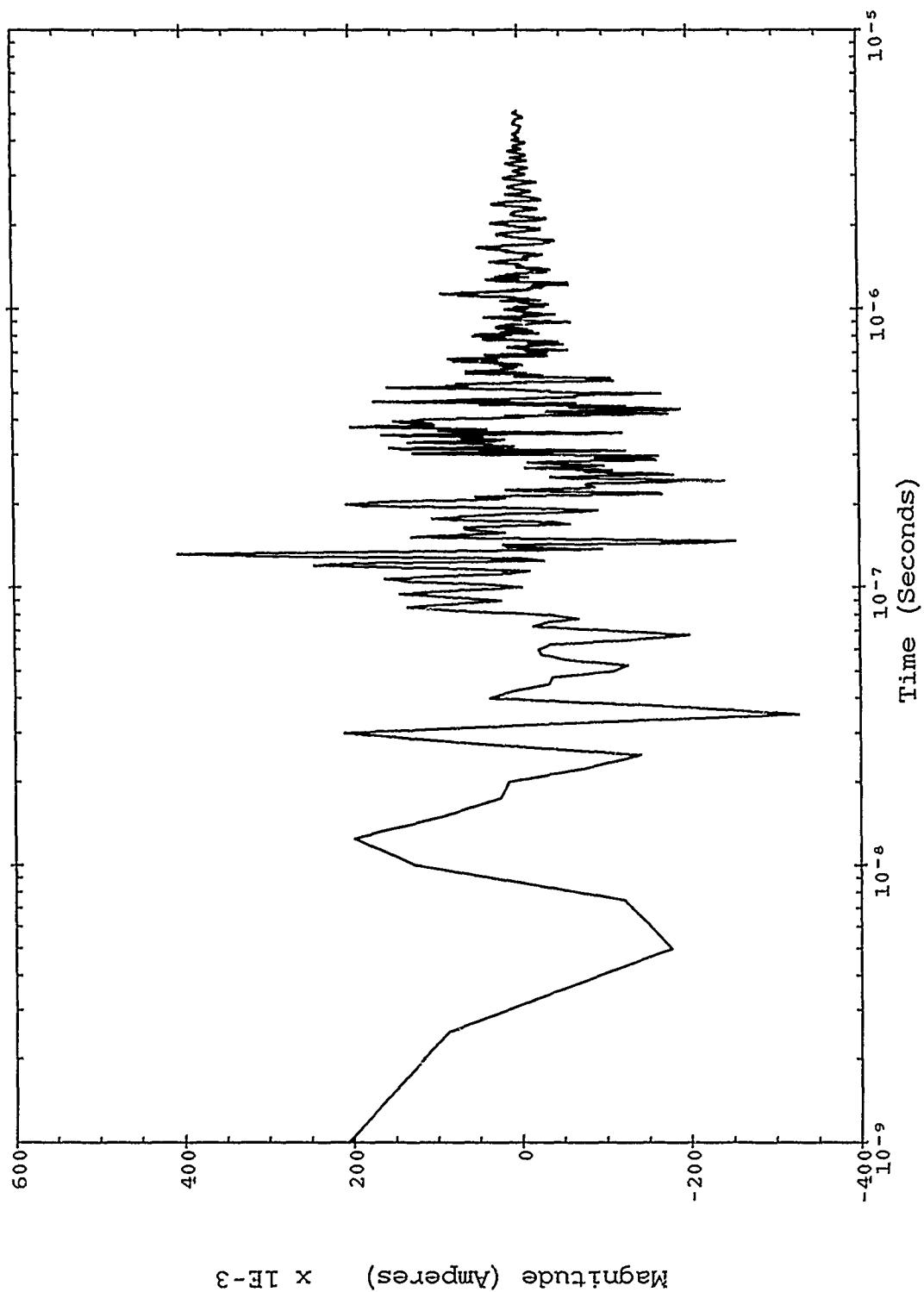


Figure B-294. Double exponential threat; TP 5727 SN 1180.

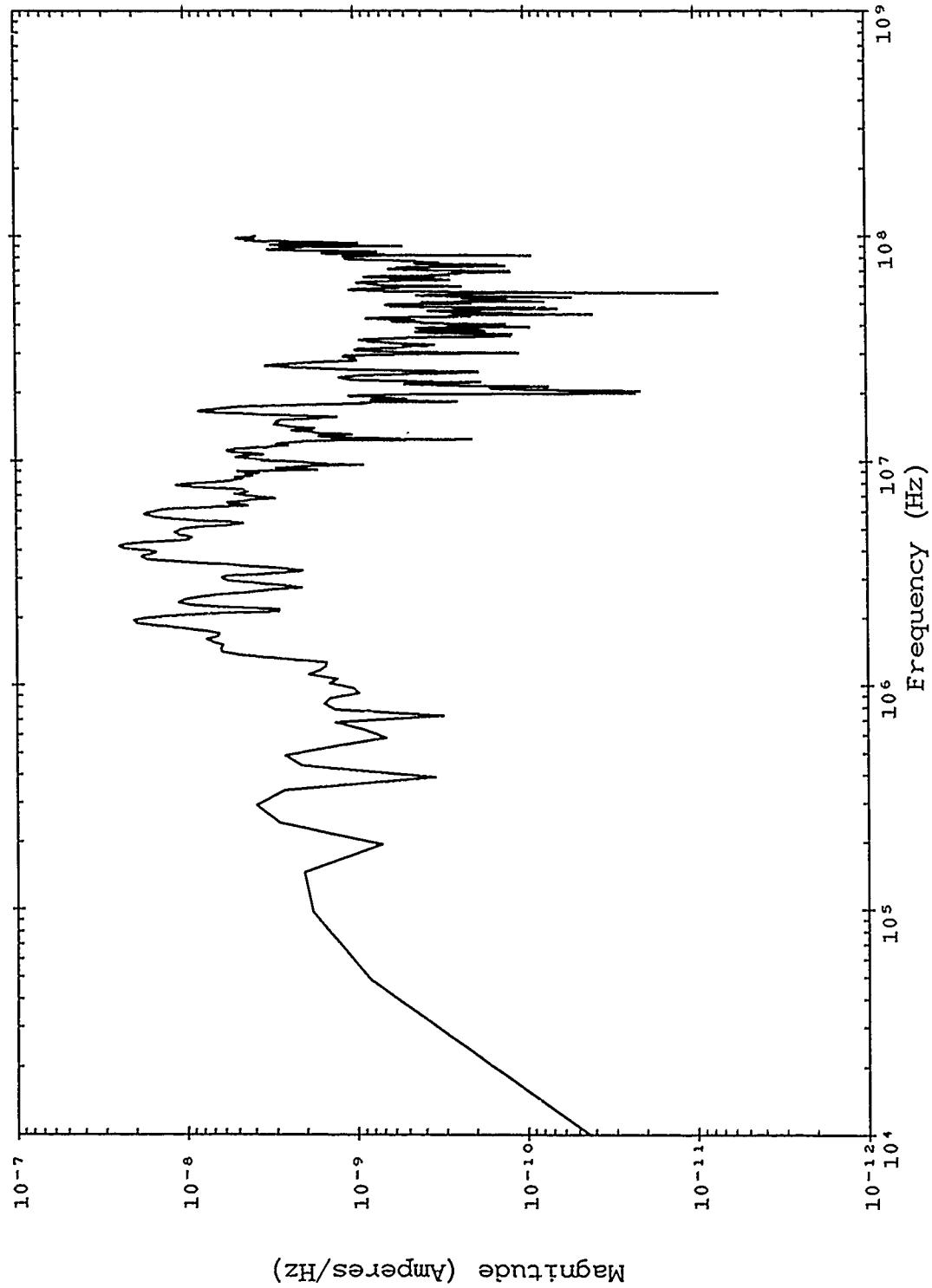


Figure B-295. Corrected TRESTLE data; TP 5737 SN 2165.

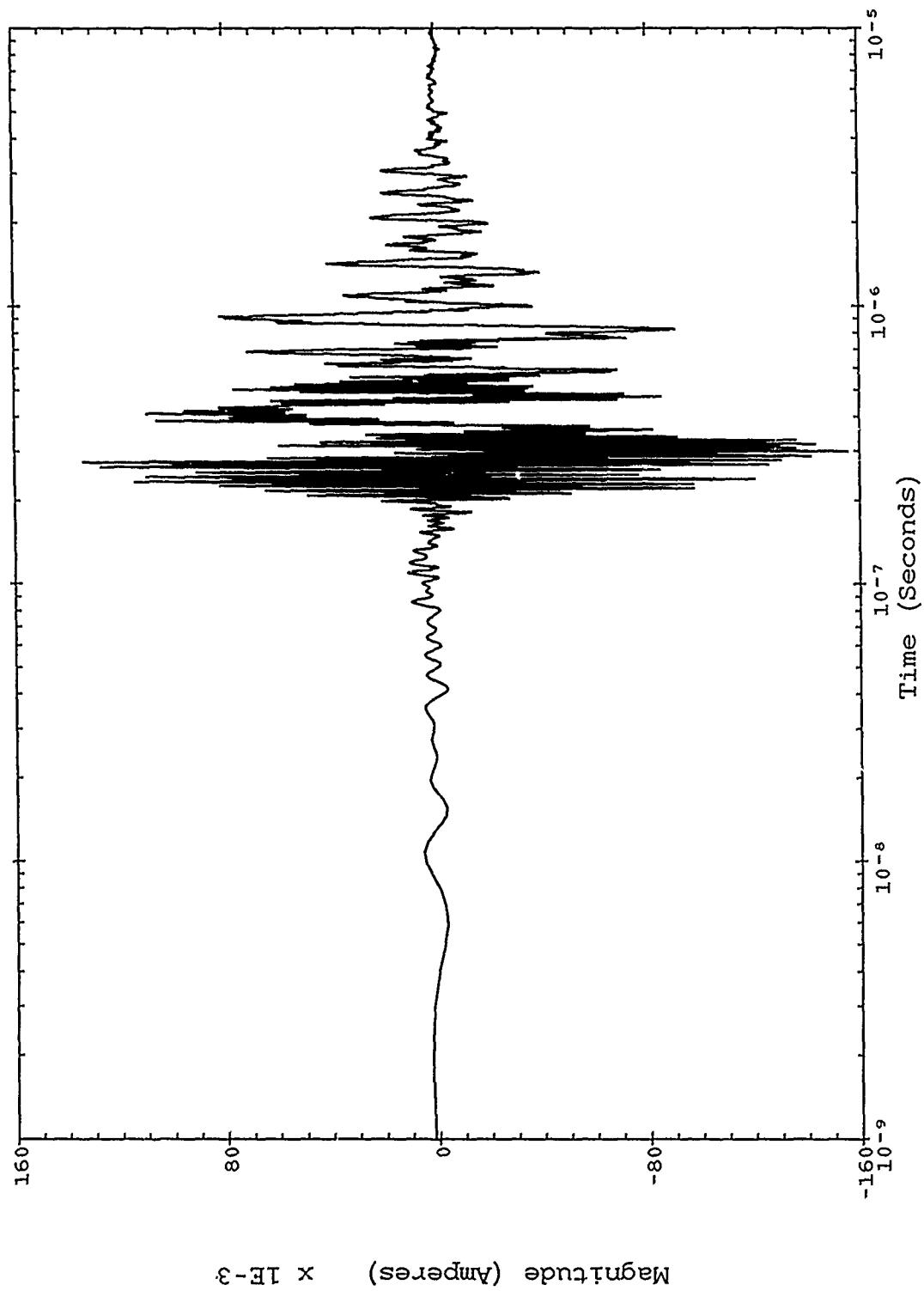


Figure B-296. Corrected TRESTLE data; TP 5737 SN 2165.

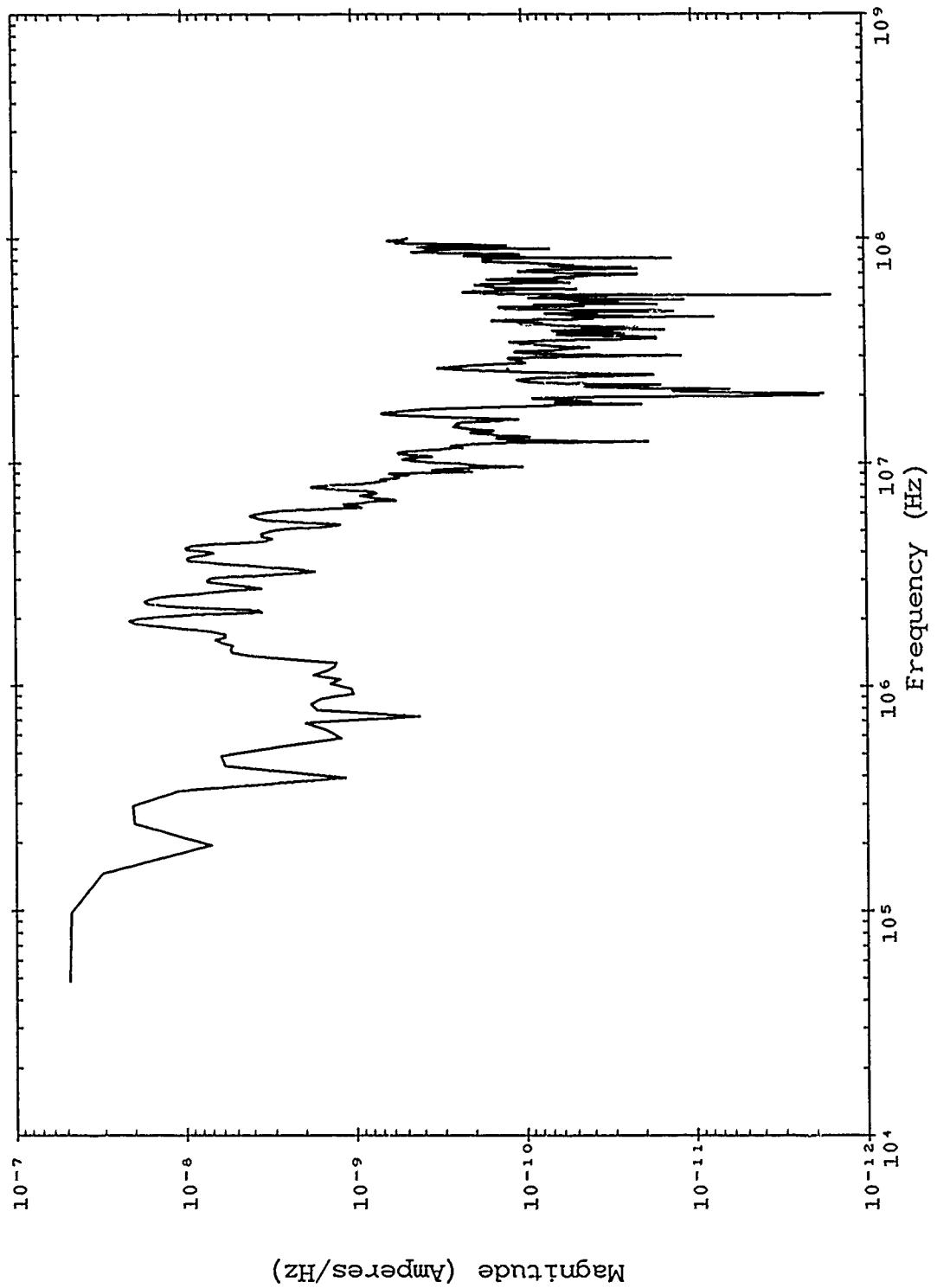


Figure B-297. Severe nearby lightning threat; TP 5737 SN 2165.

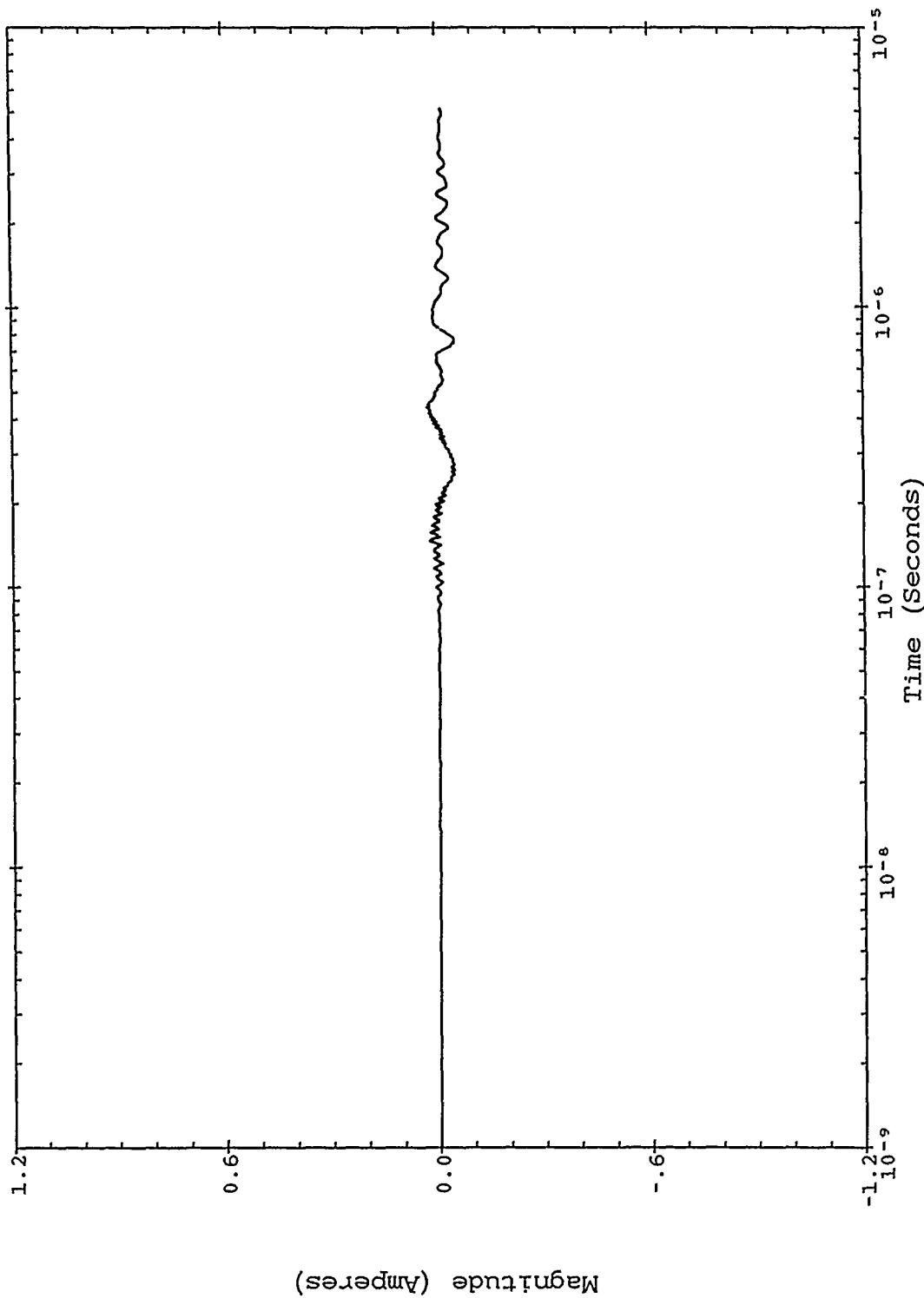


Figure B-298. Severe nearby lightning threat; TP 5737 SN 2165.

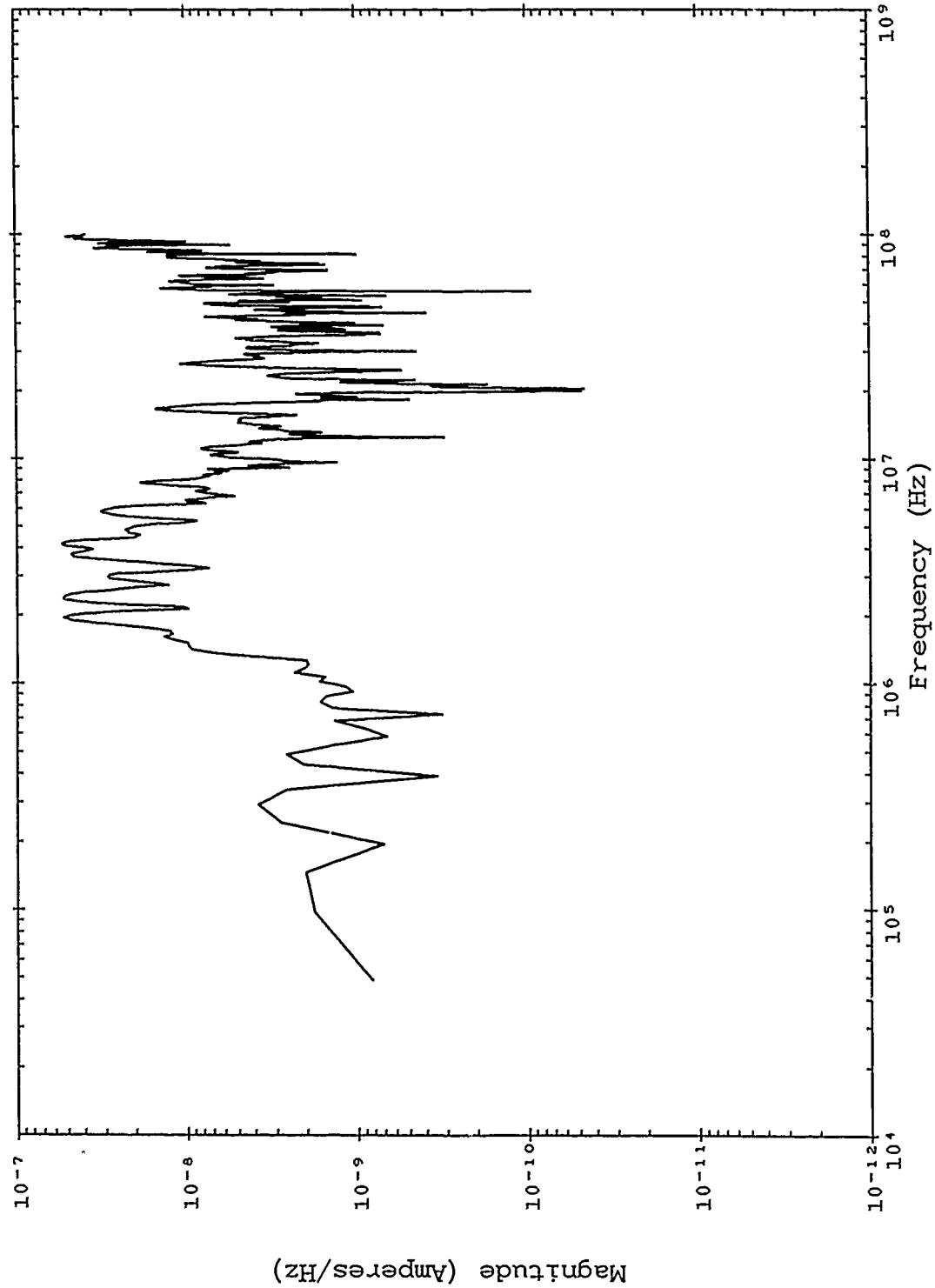


Figure B-299. Double exponential threat; TP 5737 SN 2165.

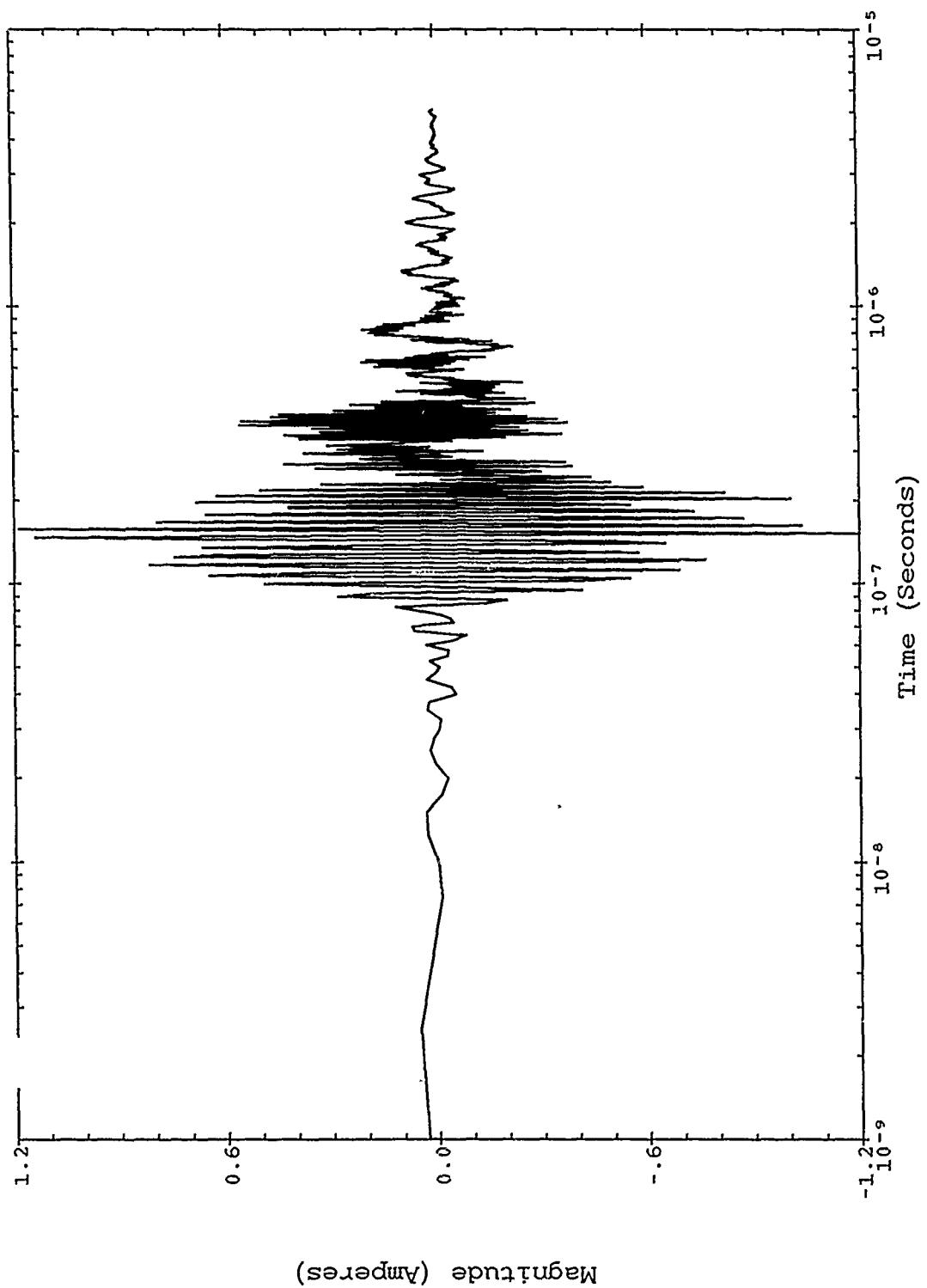


Figure B-300. Double exponential threat; TP 5737 SN 2165.

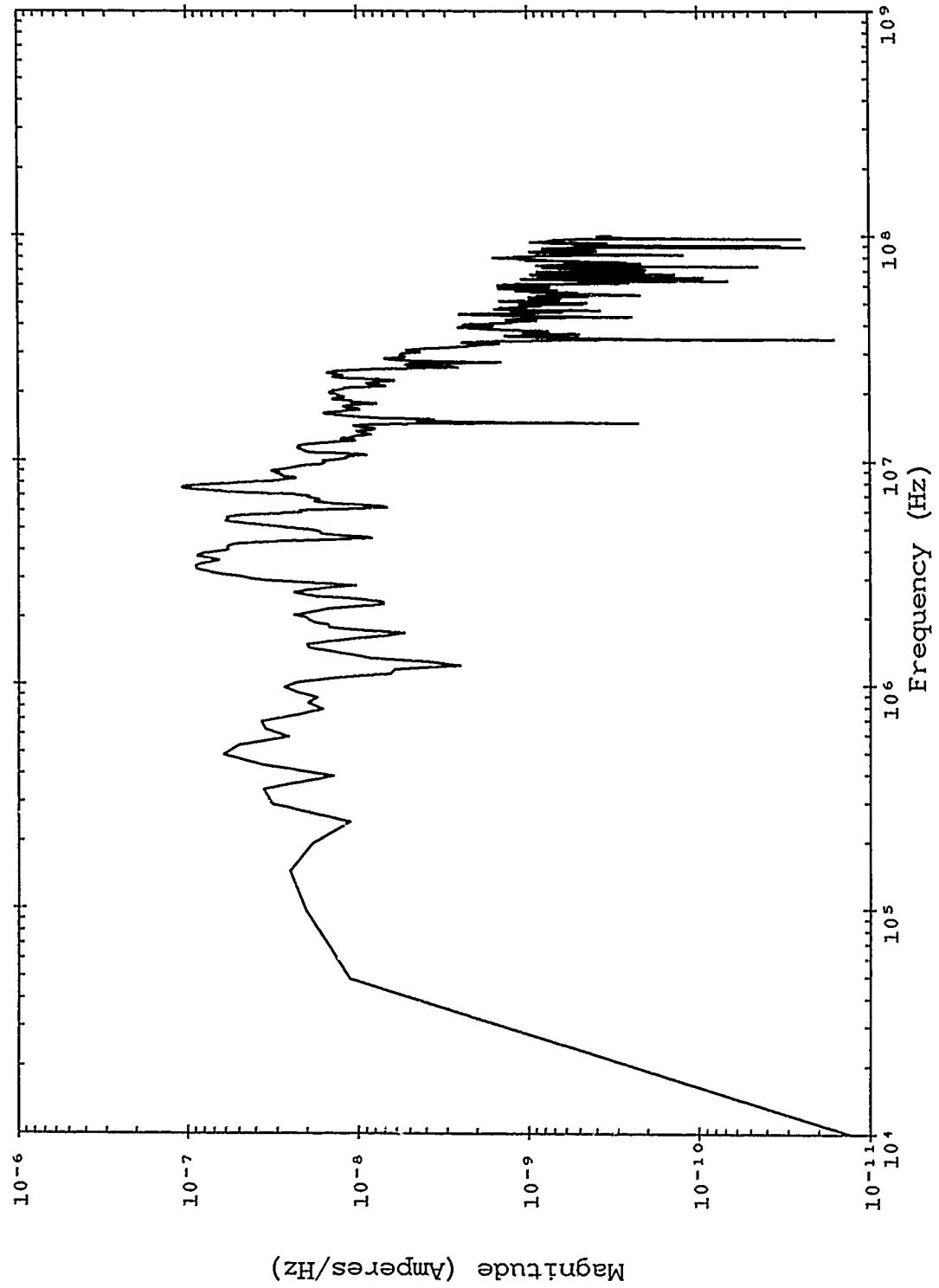


Figure B-301. Corrected TRESTLE data; TP 5813 SN 2606.

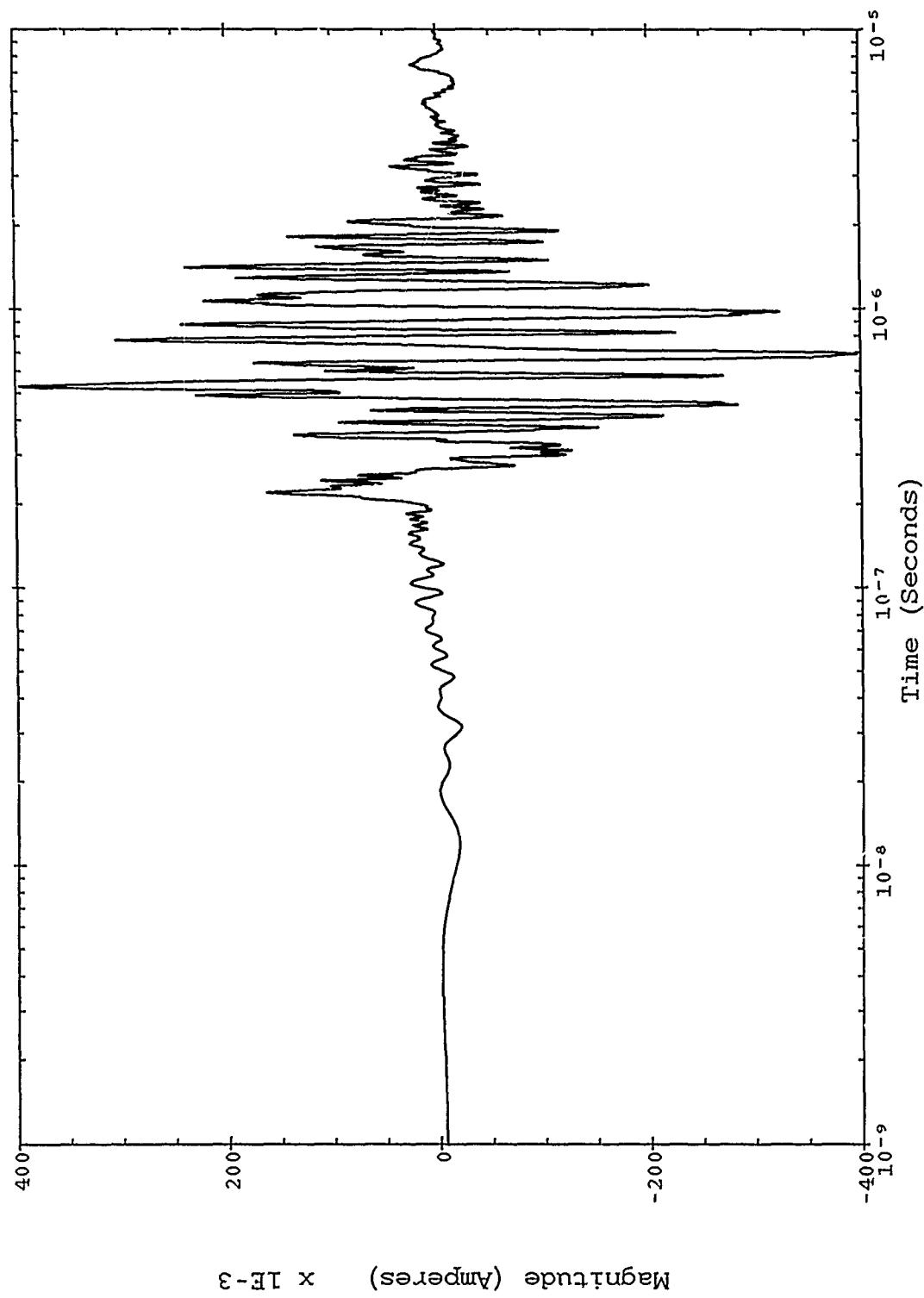


Figure B-302. Corrected TRESTLE data; TP 5813 SN 2606.

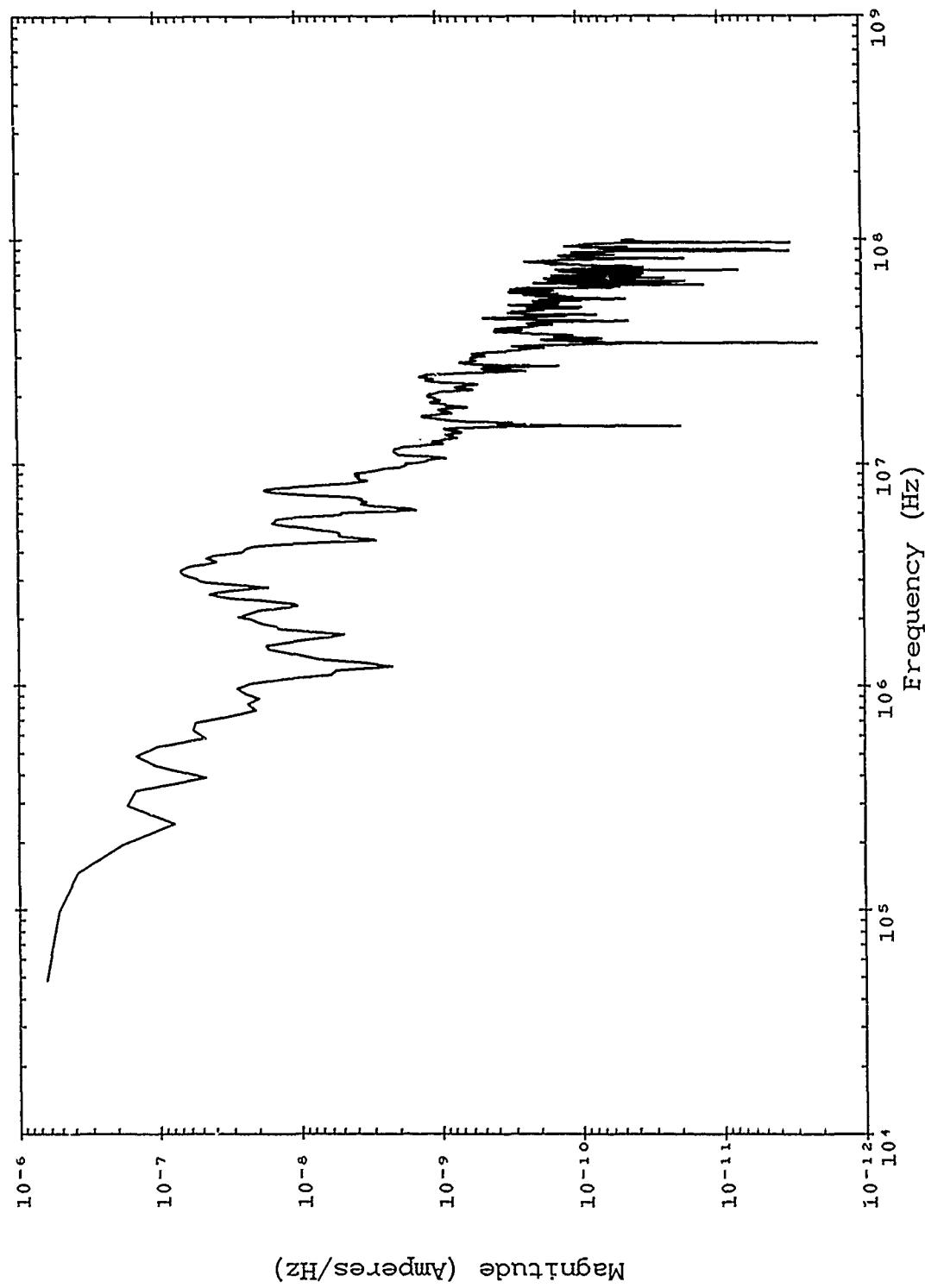


Figure B-303. Severe nearby lightning threat; TP 5813 SN 2606.

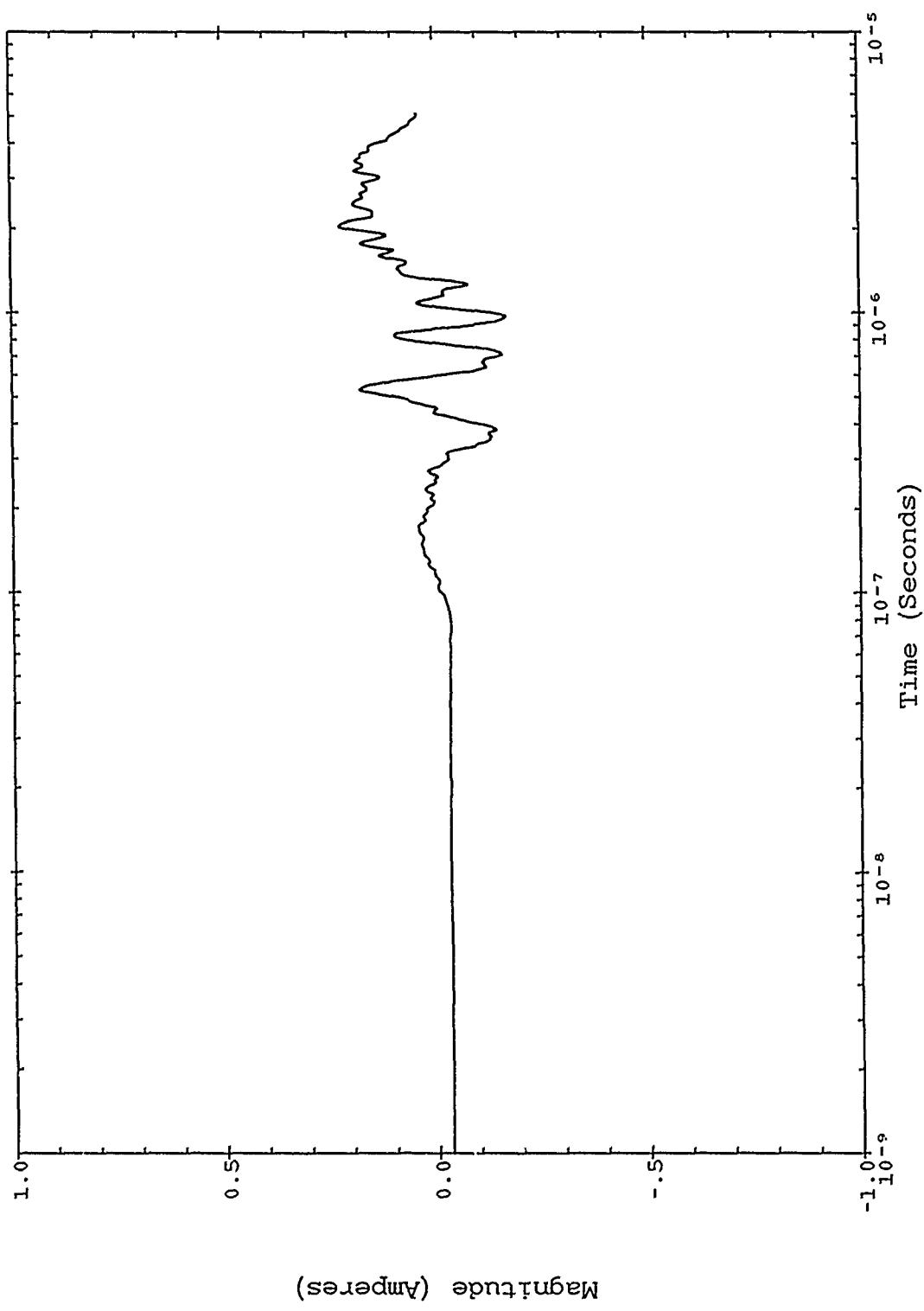


Figure B-304. Severe nearby lightning threat; TP 5813 SN 2606.

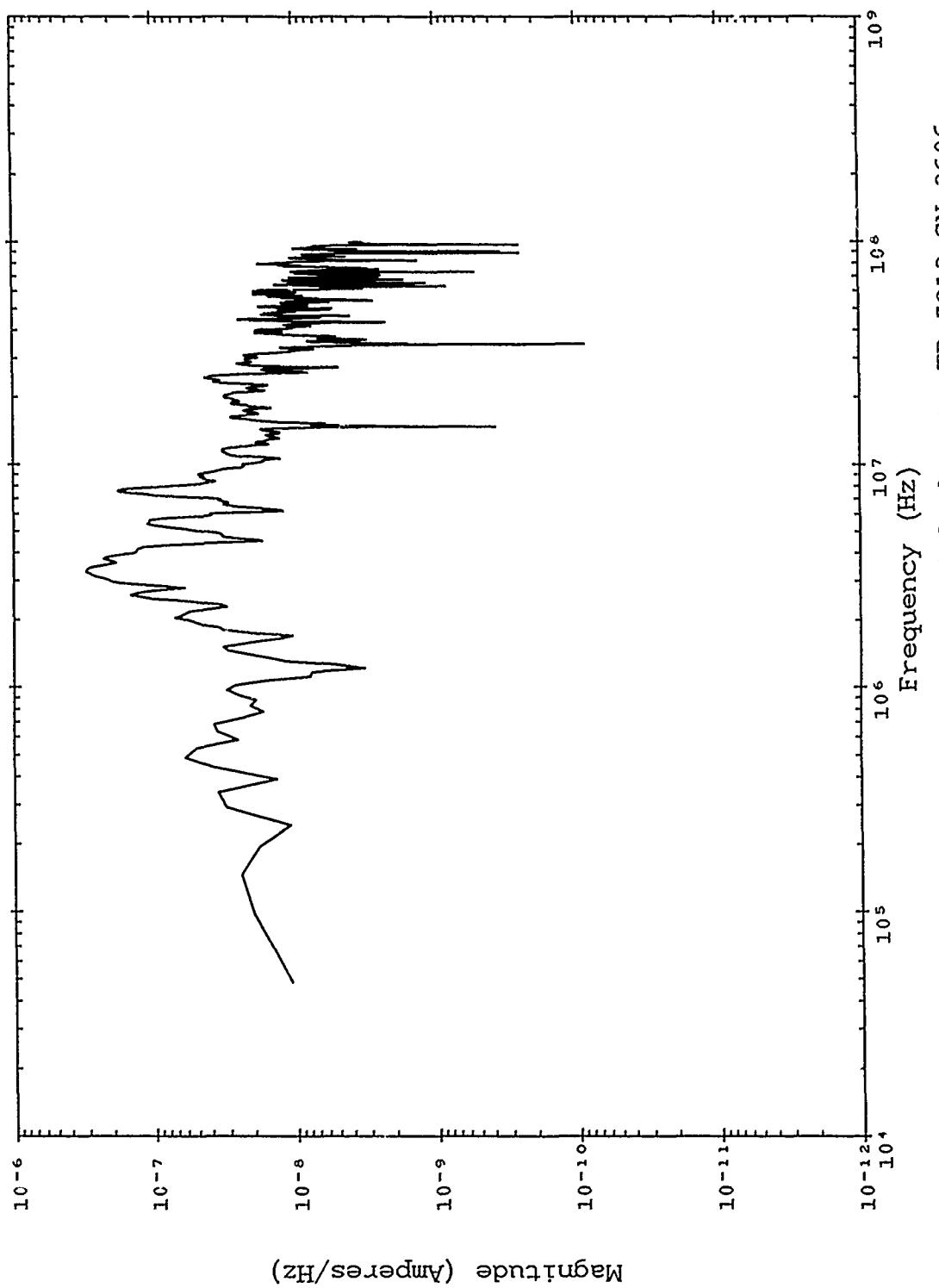


Figure B-305. Double exponential threat; TP 5813 SN 2606.

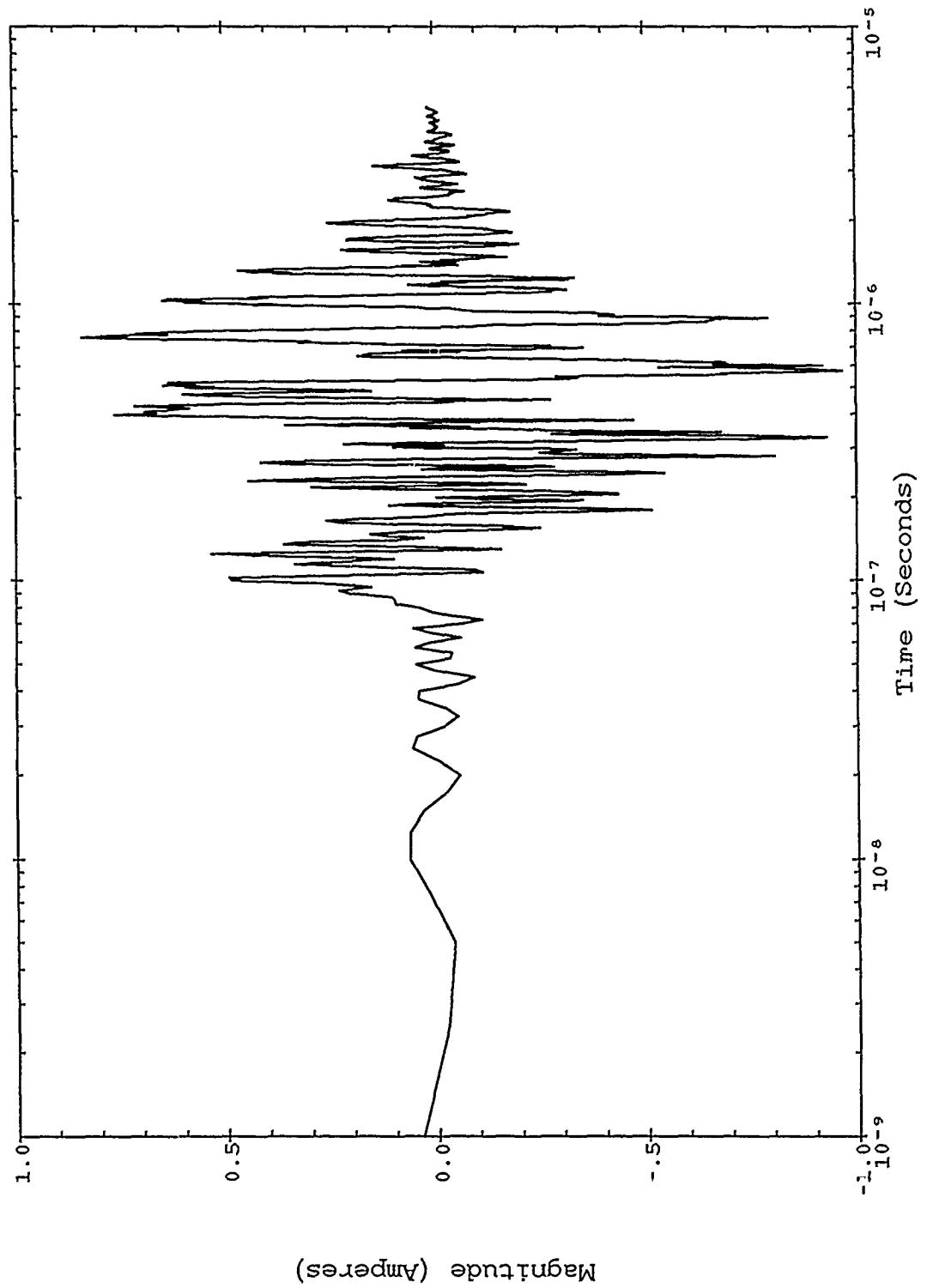


Figure B-306. Double exponential threat; TP 5813 SN 2606.

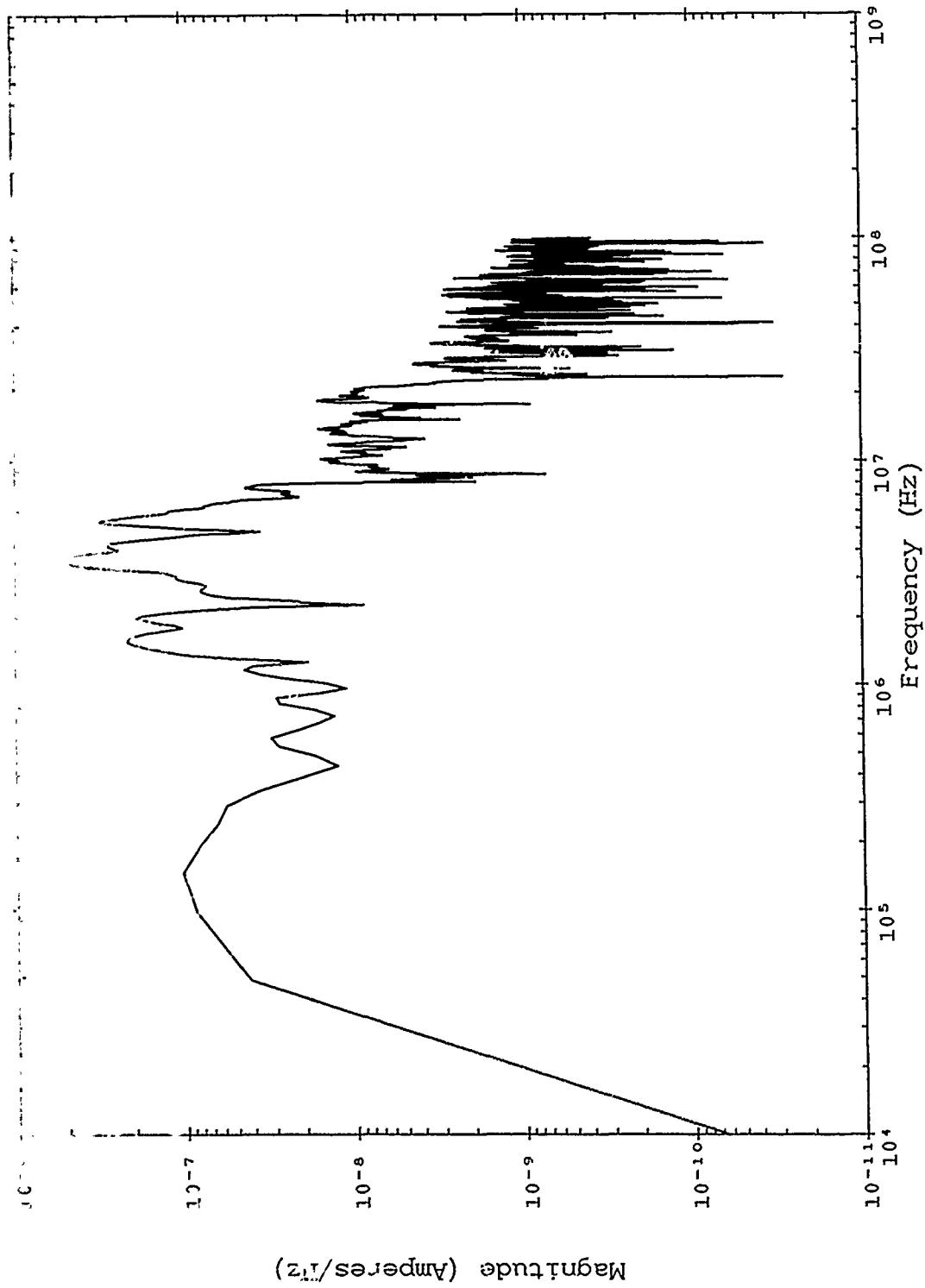


Figure B-307. Corrected TRESTLE data; TP 5869 SN 2271.

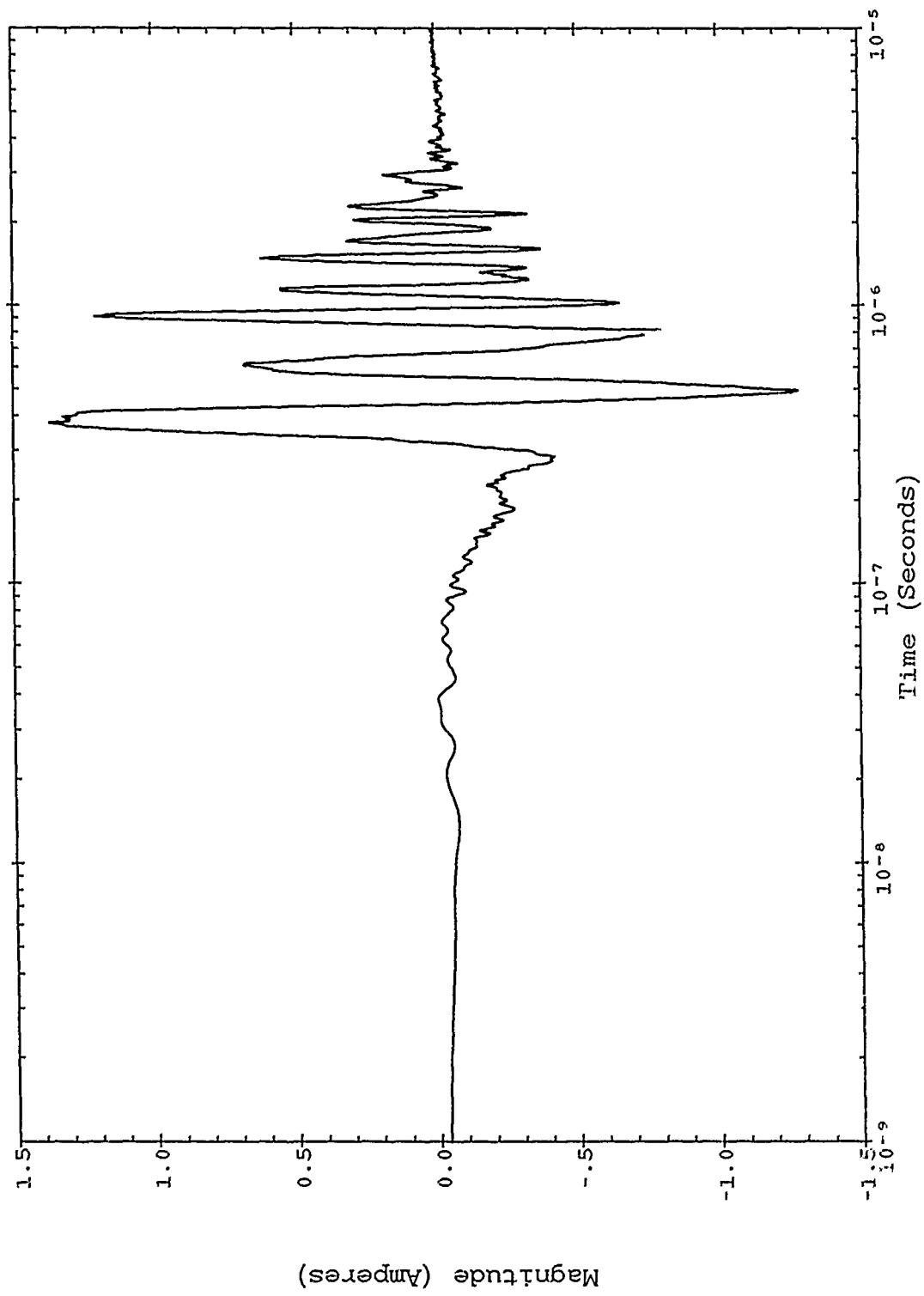


Figure 6-308. Corrected TREBLE data; TP 5869 SN 2271.

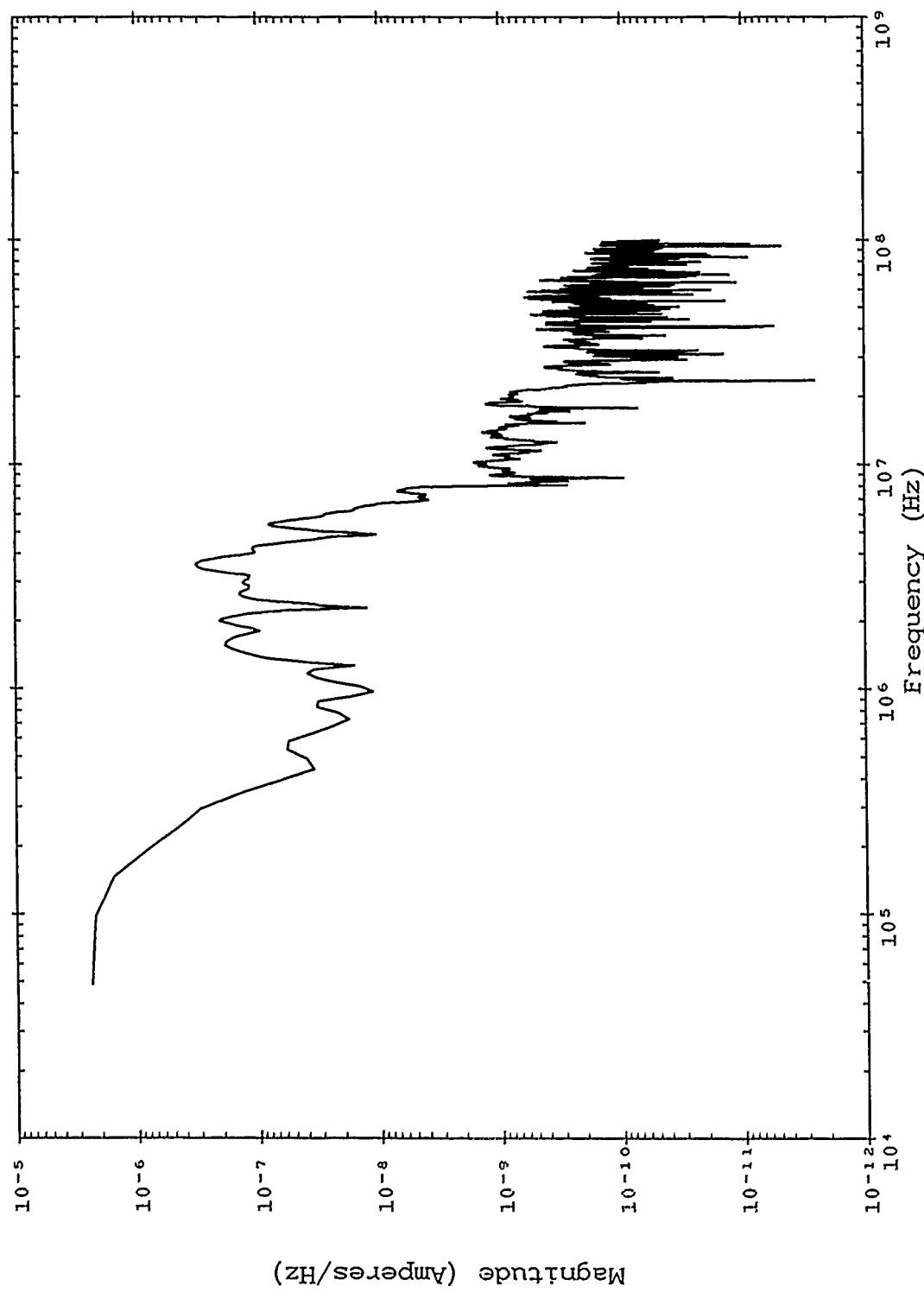


Figure B-309. Severe nearby lightning threat; TP 5869 SN 2271.

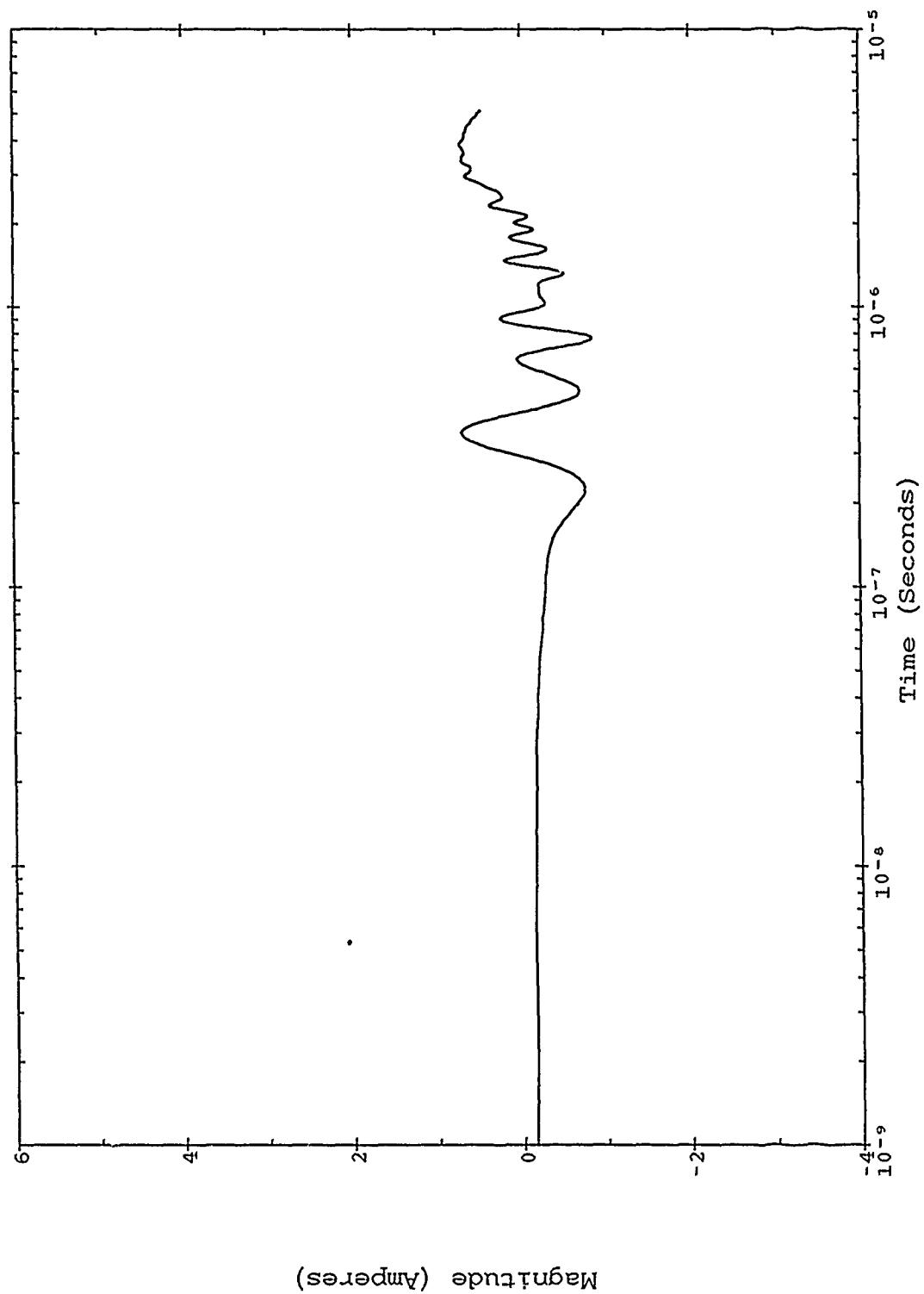


Figure B-310. Severe nearby lightning threat; TP 5869 SN 2271.

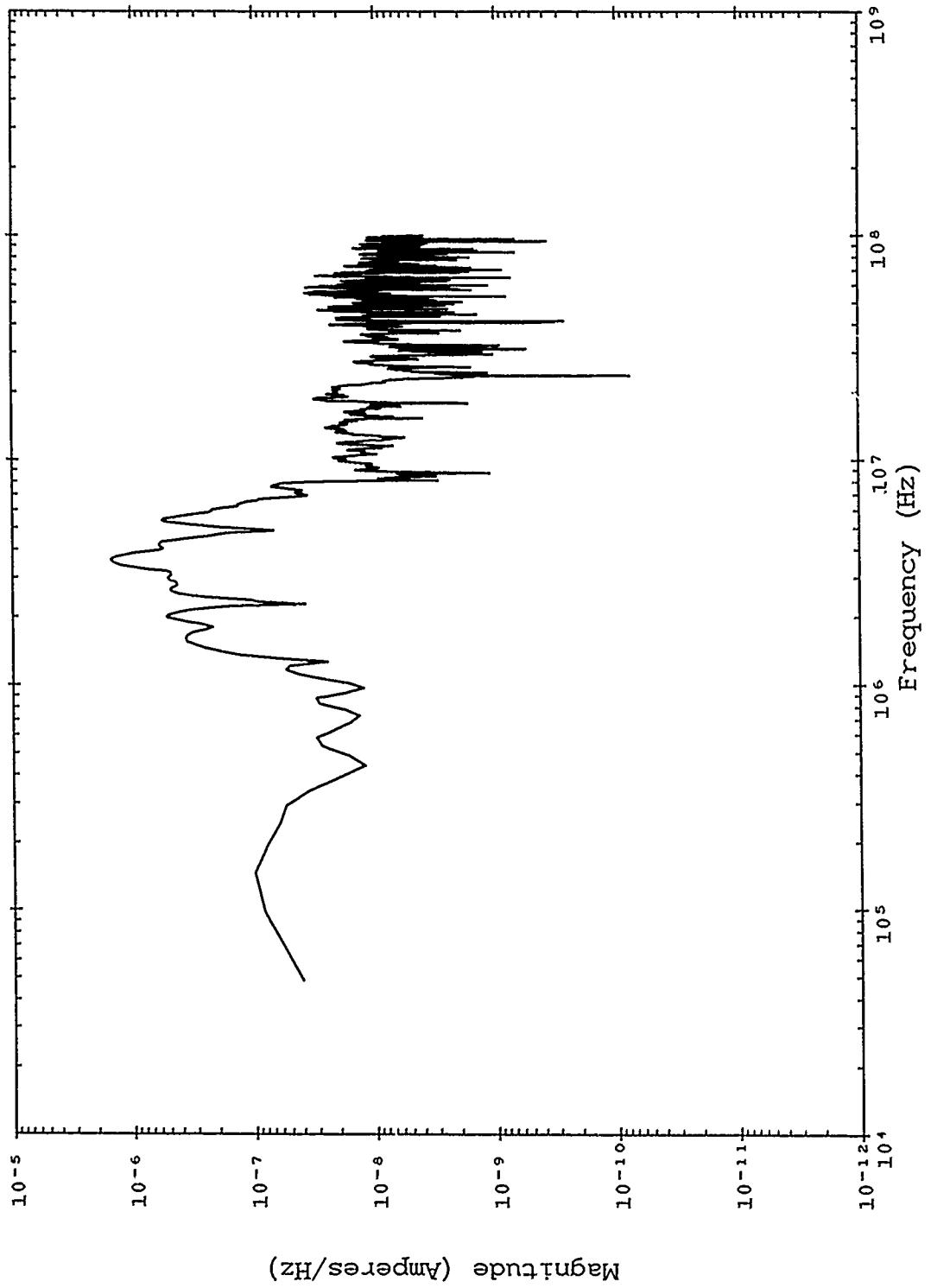


Figure B-311. Double exponential threat; TP 5869 SN 2271.

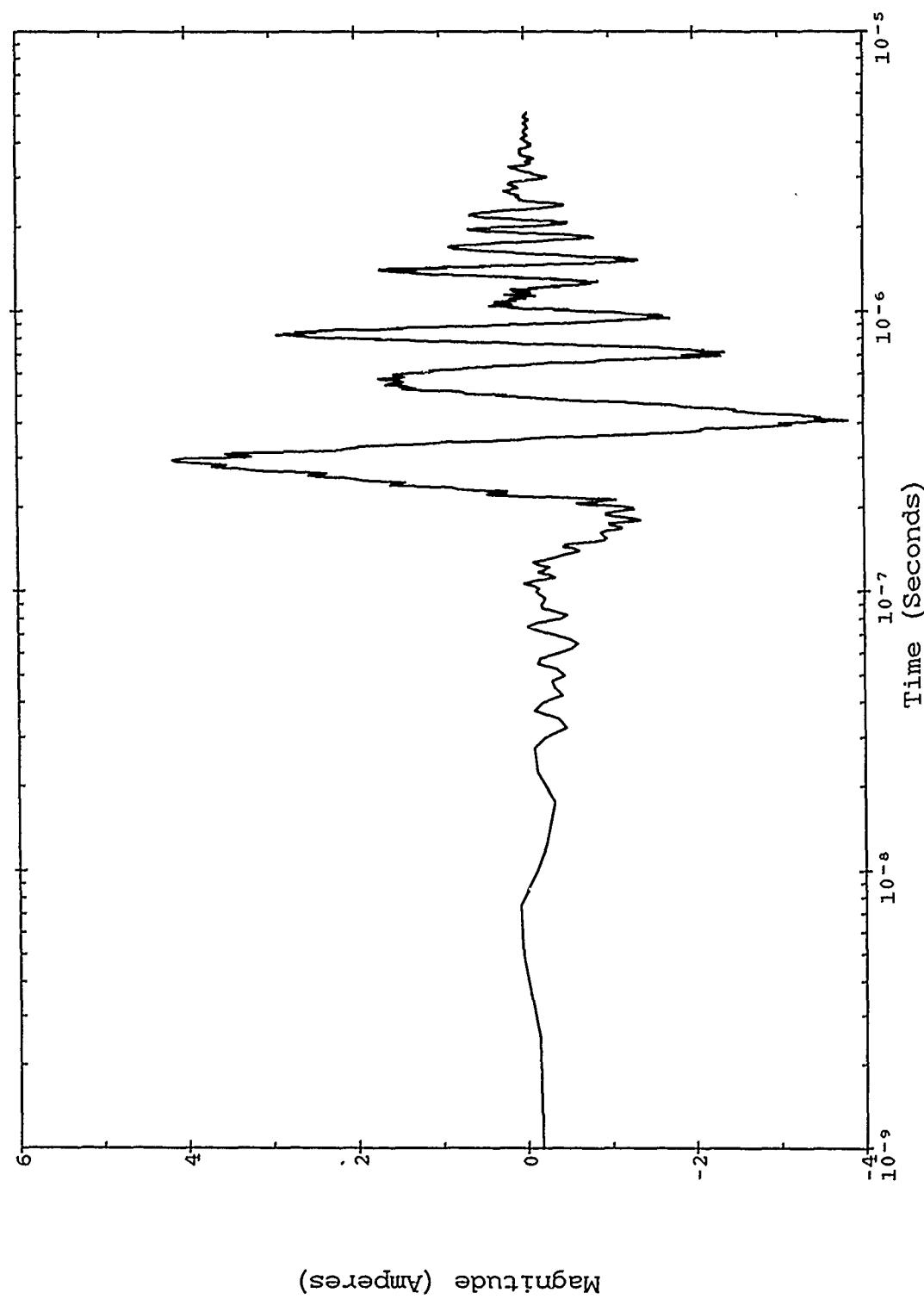


Figure B-312. Double exponential threat; TP 5869 SN 2271.

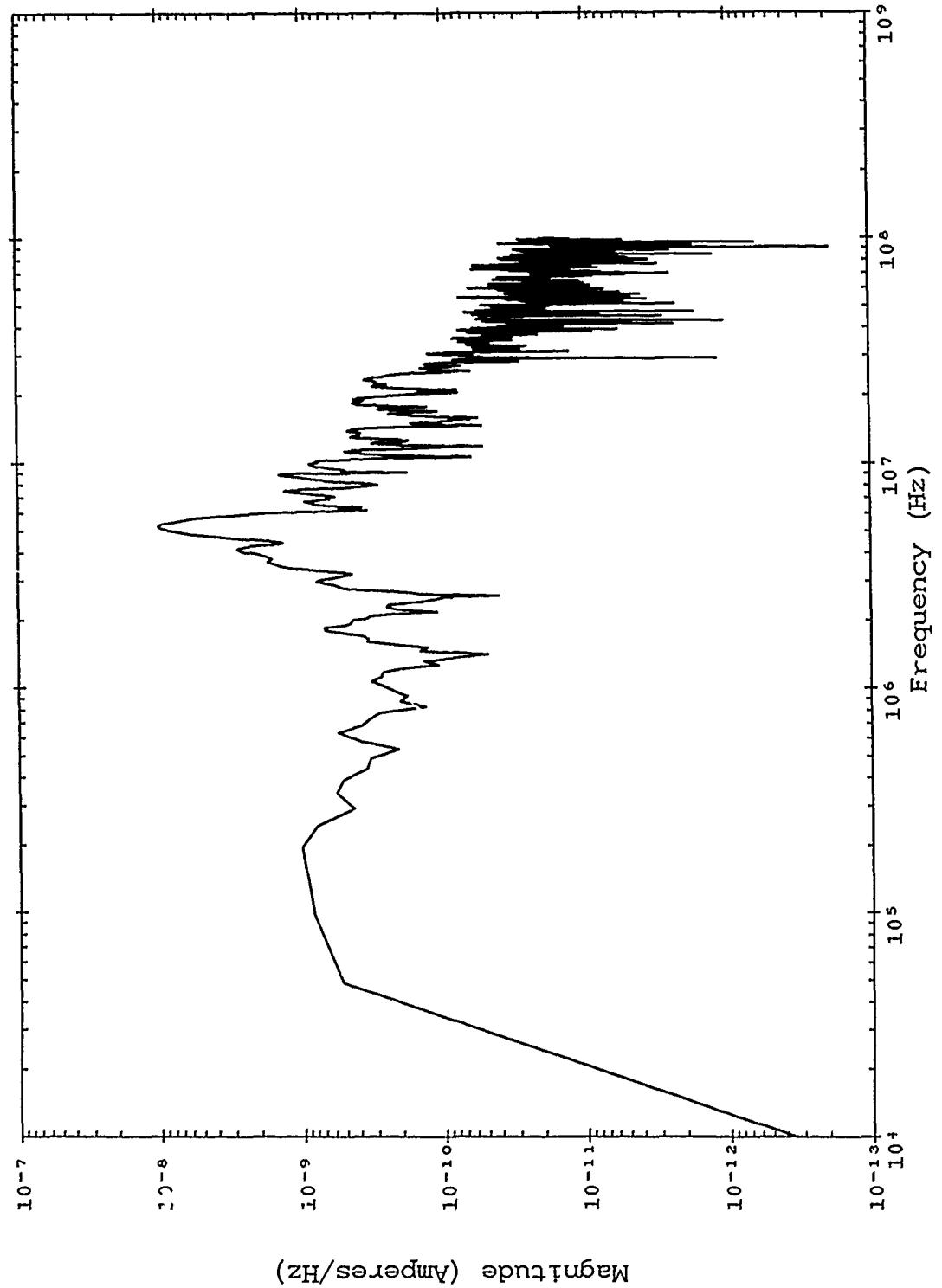


Figure B-313. Corrected TRESTLE data; TP 6369 SN 2584.

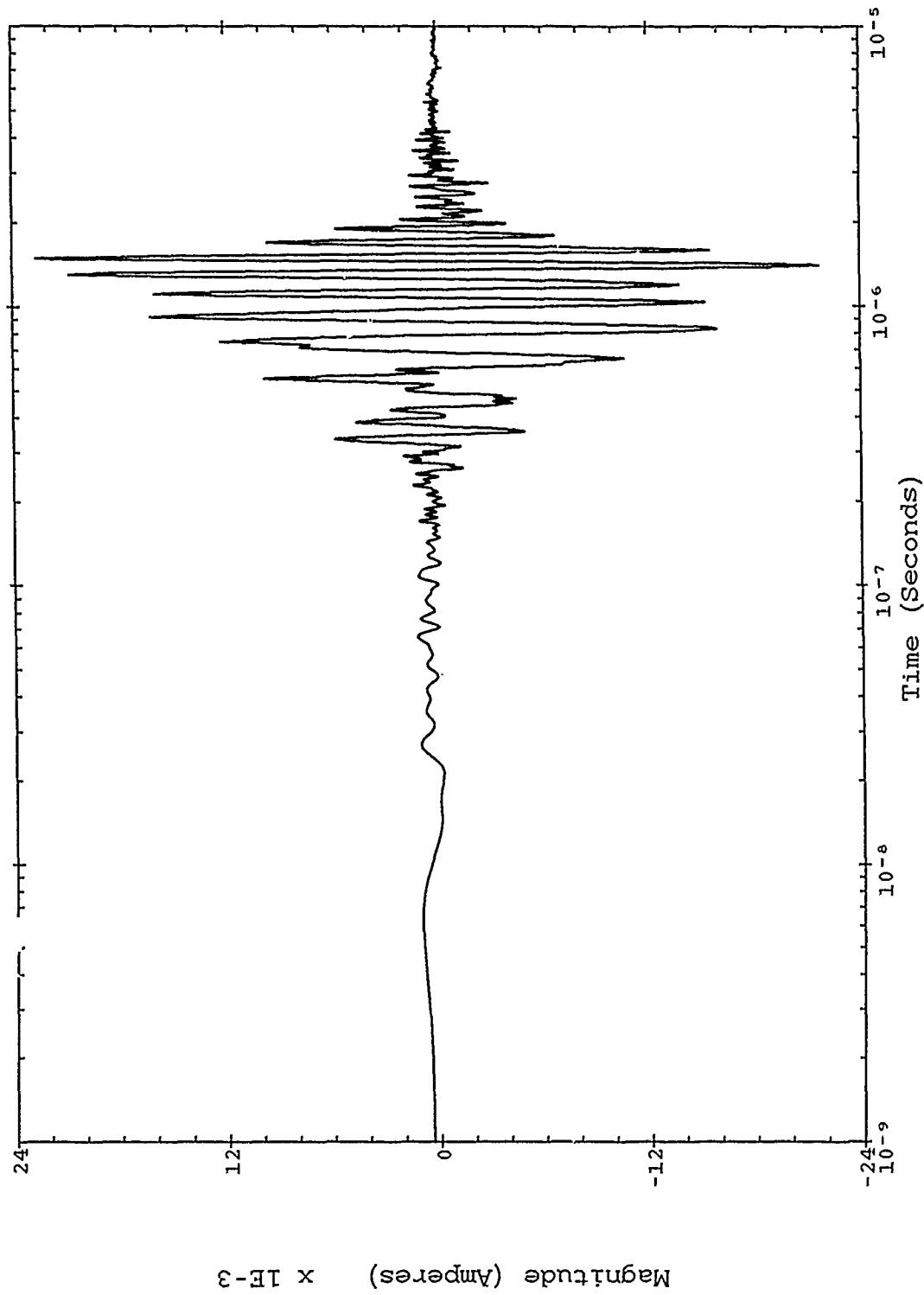


Figure B-314. Corrected TRESTLE data; TP 6369 SN 2584.

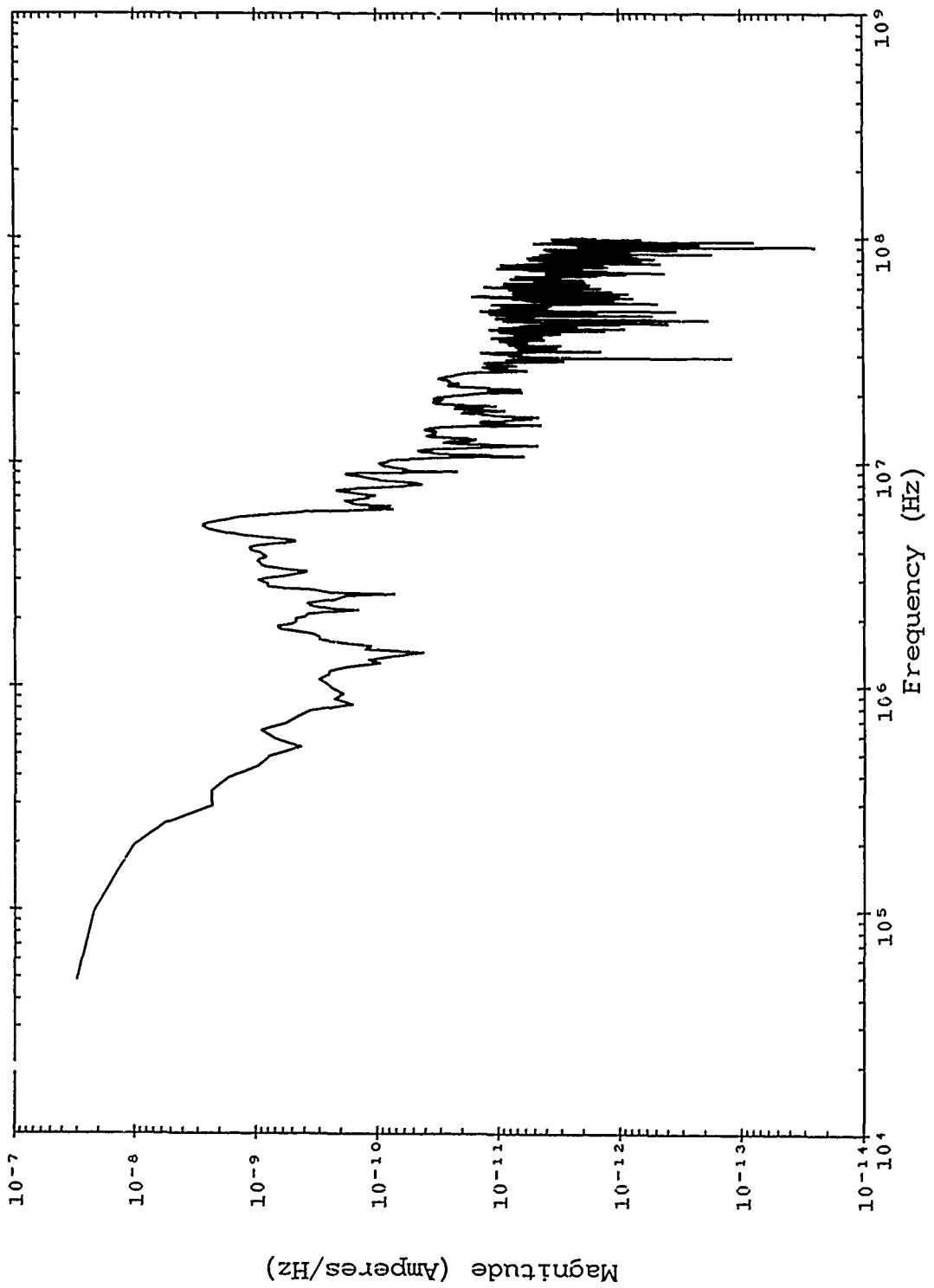


Figure B-315. Severe nearby lightning threat; TP 6369 SN 2584.

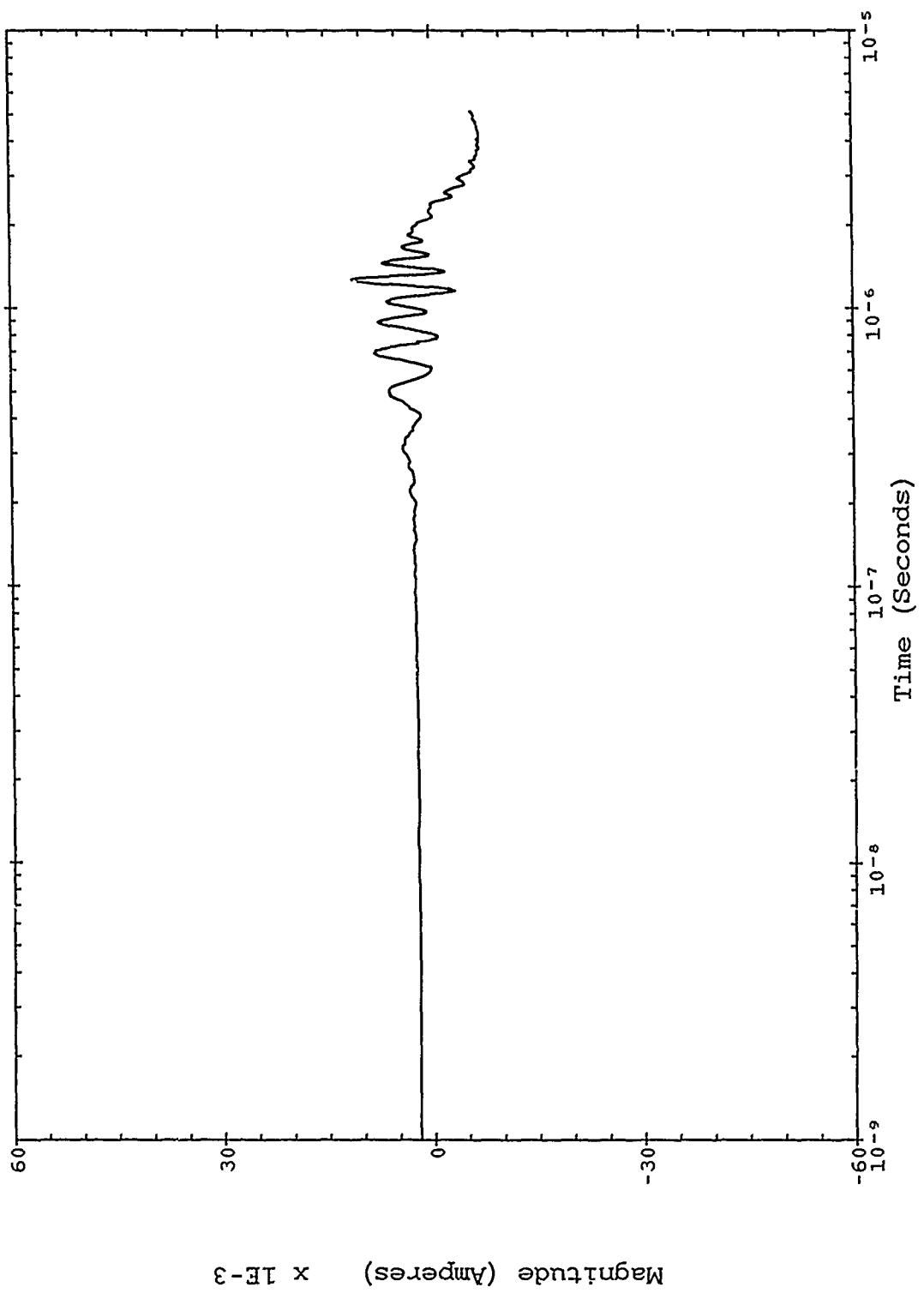


Figure B-316. Severe nearby lightning threat; TP 6369 SN 2584.

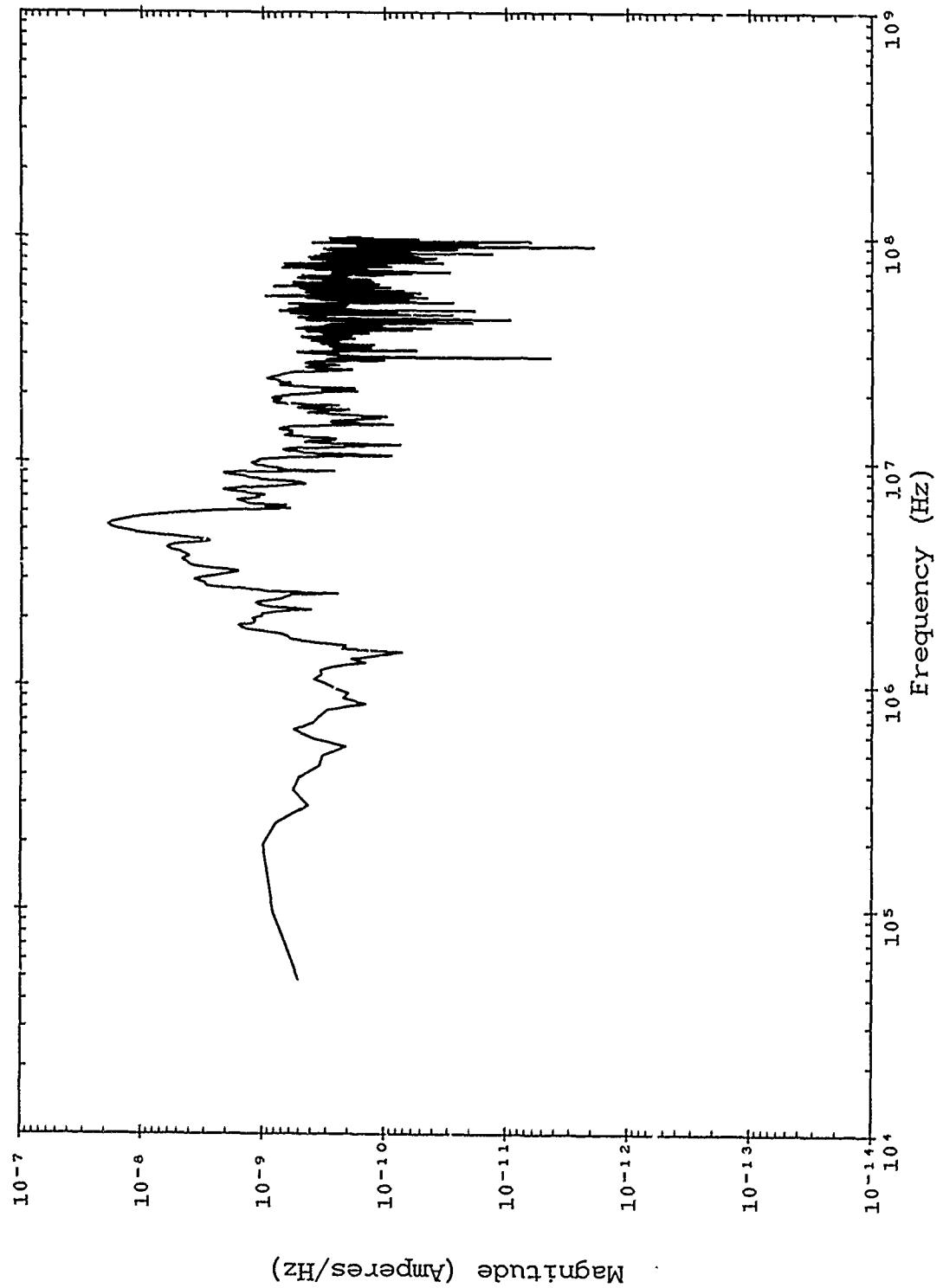


Figure B-317. Double exponential threat; TP 6369 SN 2584.

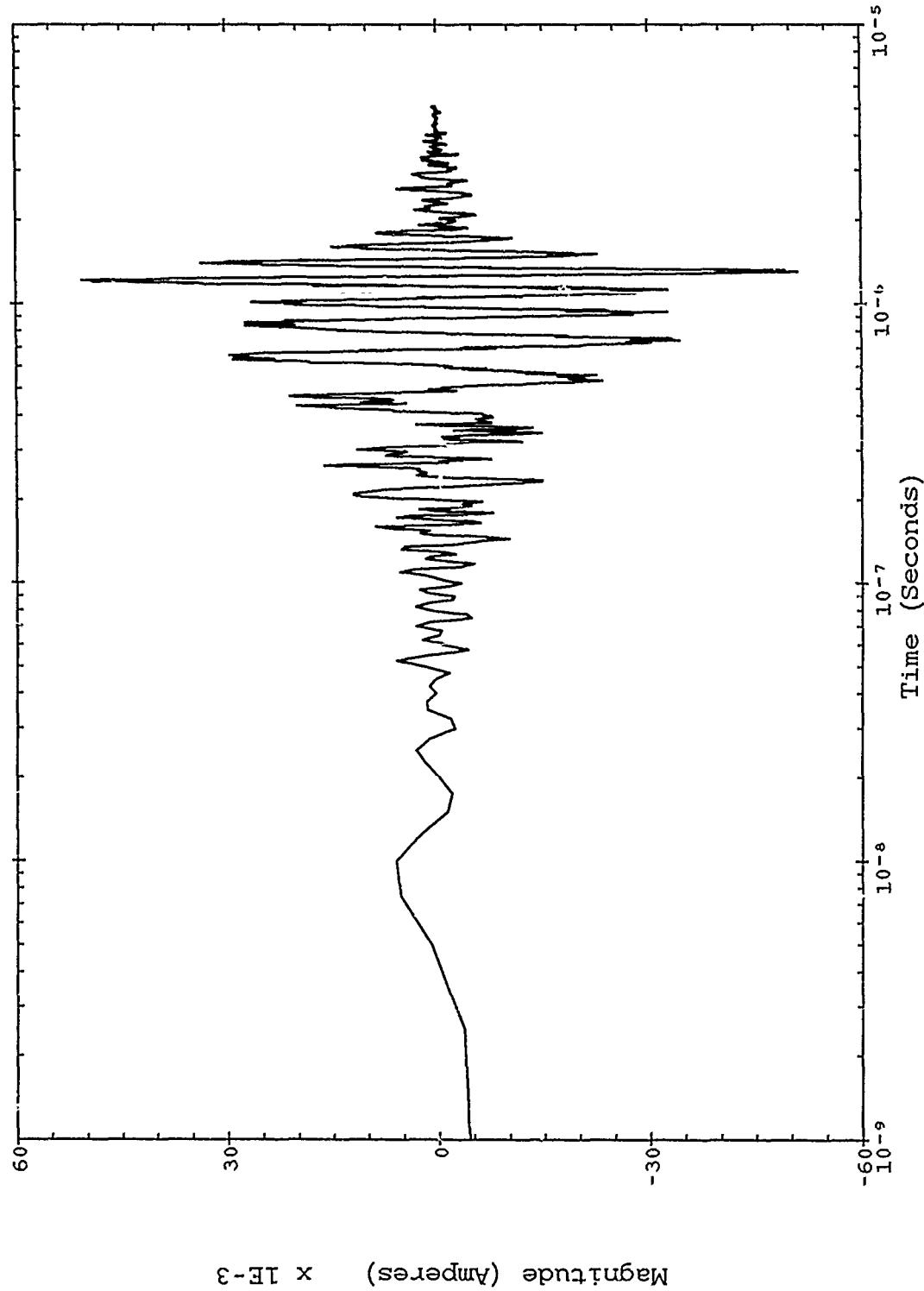


Figure B-318. Double exponential threat; TP 6369 SN 2584.

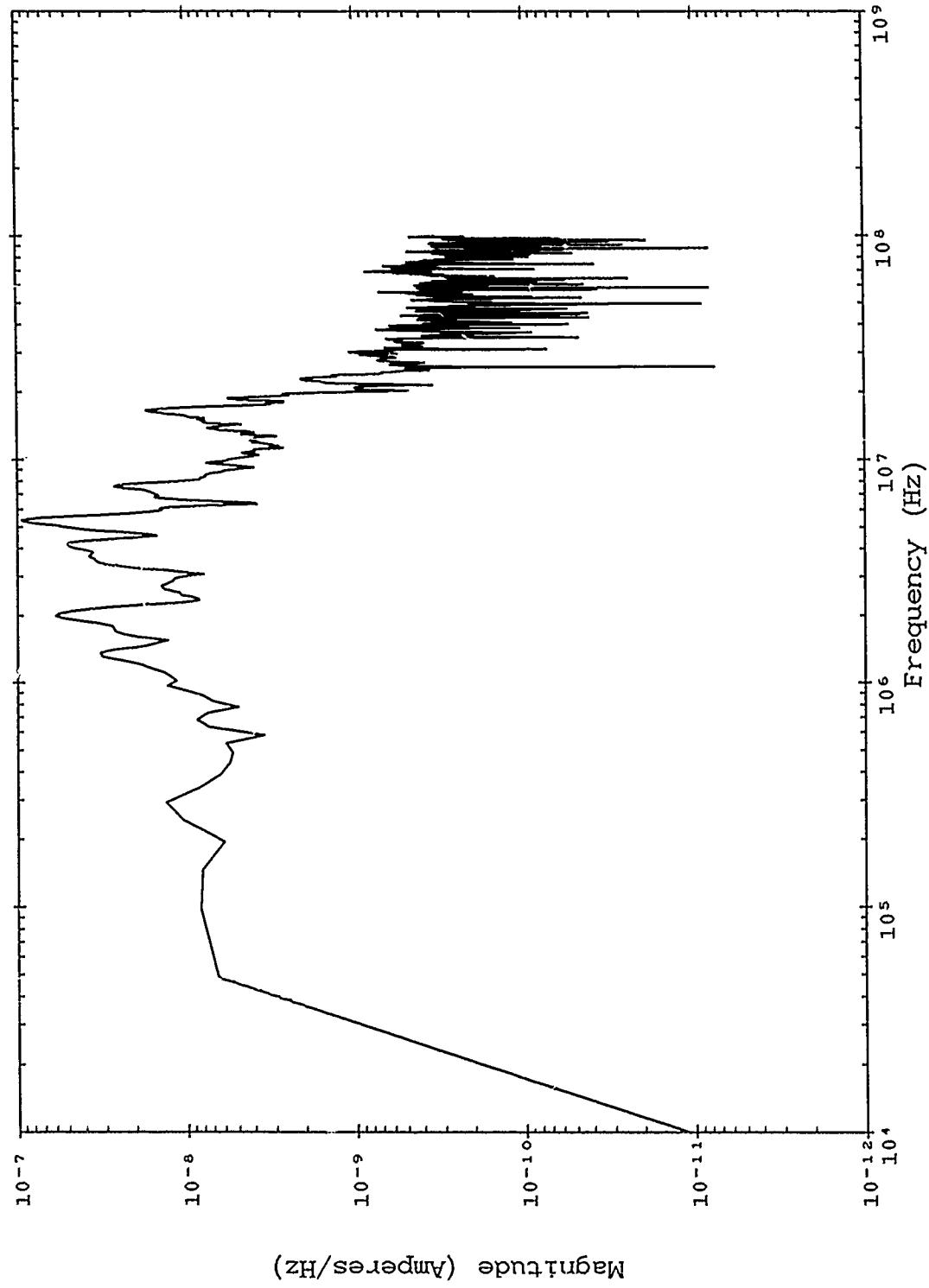


Figure B-319. Corrected TRESTLE data; TP 6381 SN 1151.

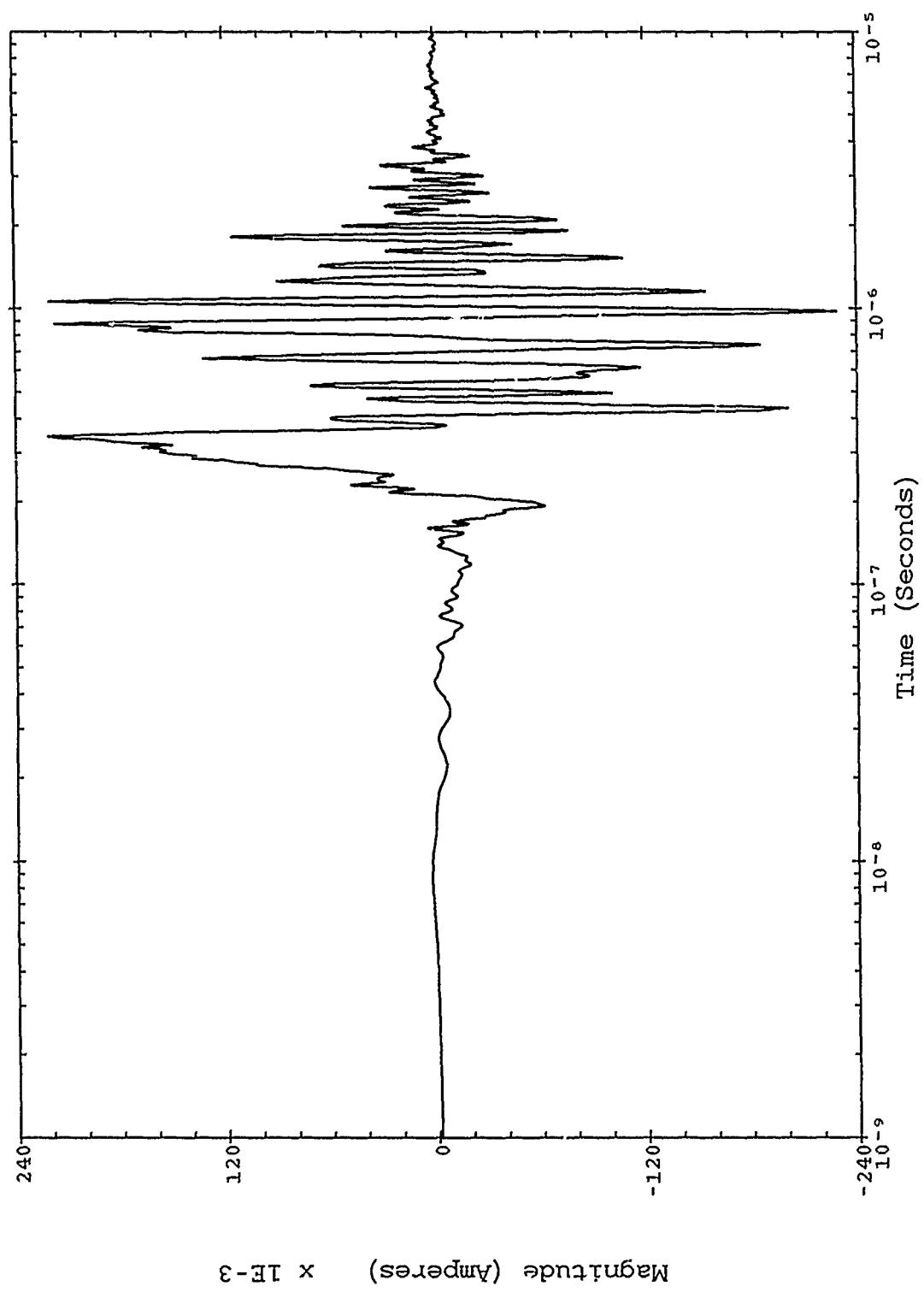


Figure B-320. Corrected TRESTLE data; TP 6381 SN 1151.

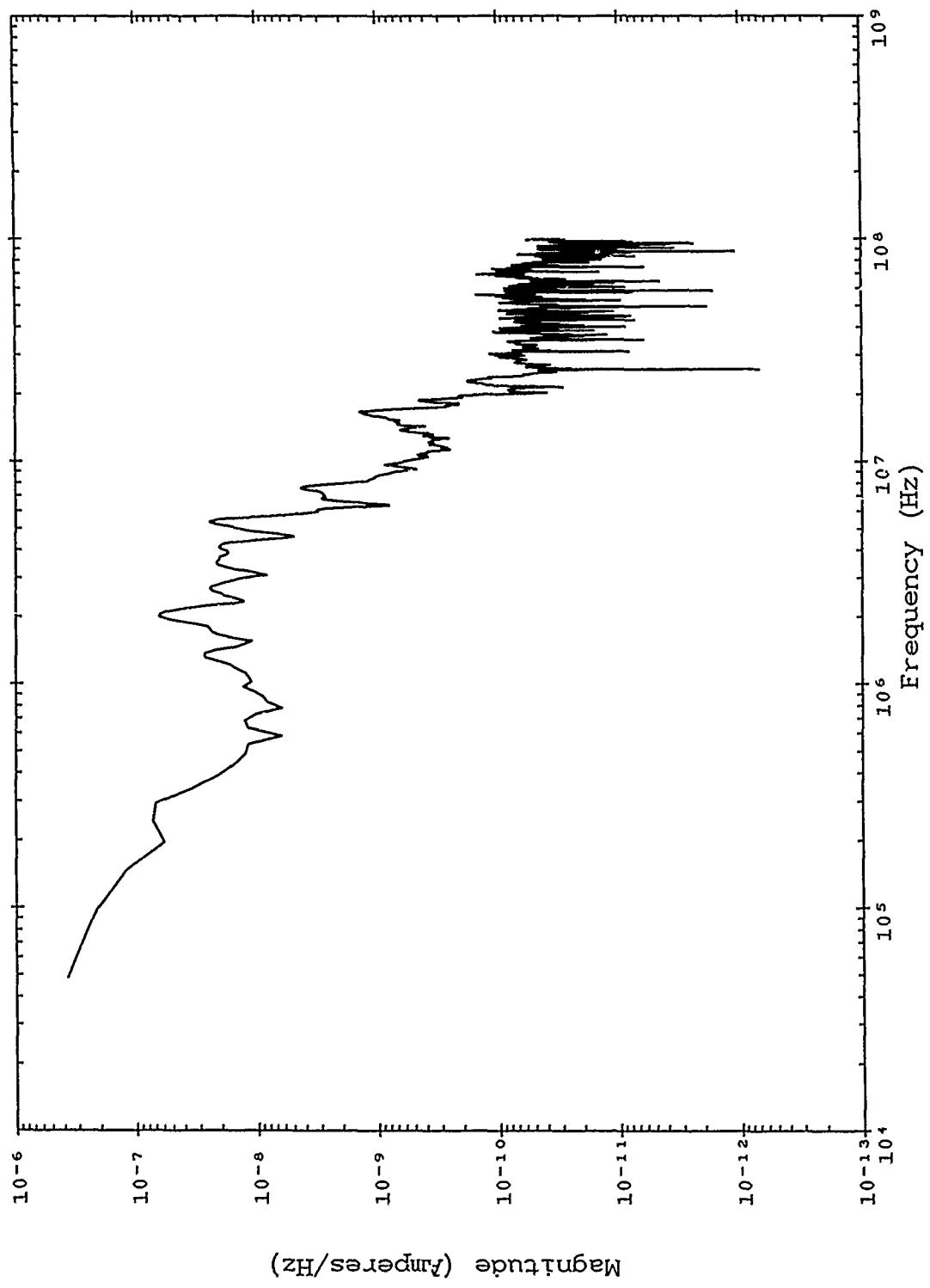


Figure B-321. Severe nearby lightning threat; TP 6381 SN 1151.

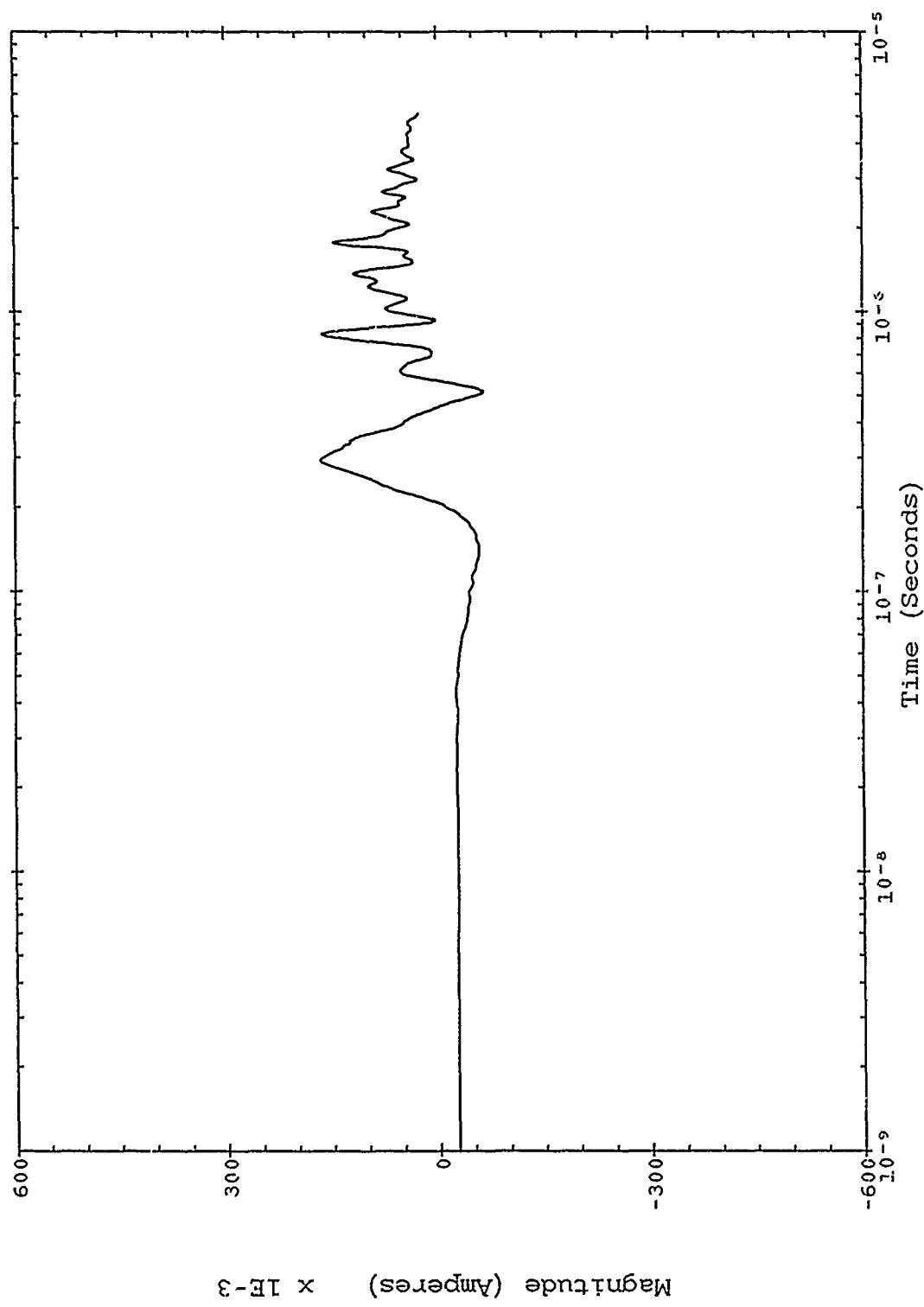


Figure B-322. Severe nearby lightning threat; TP 6381 SN 1151.

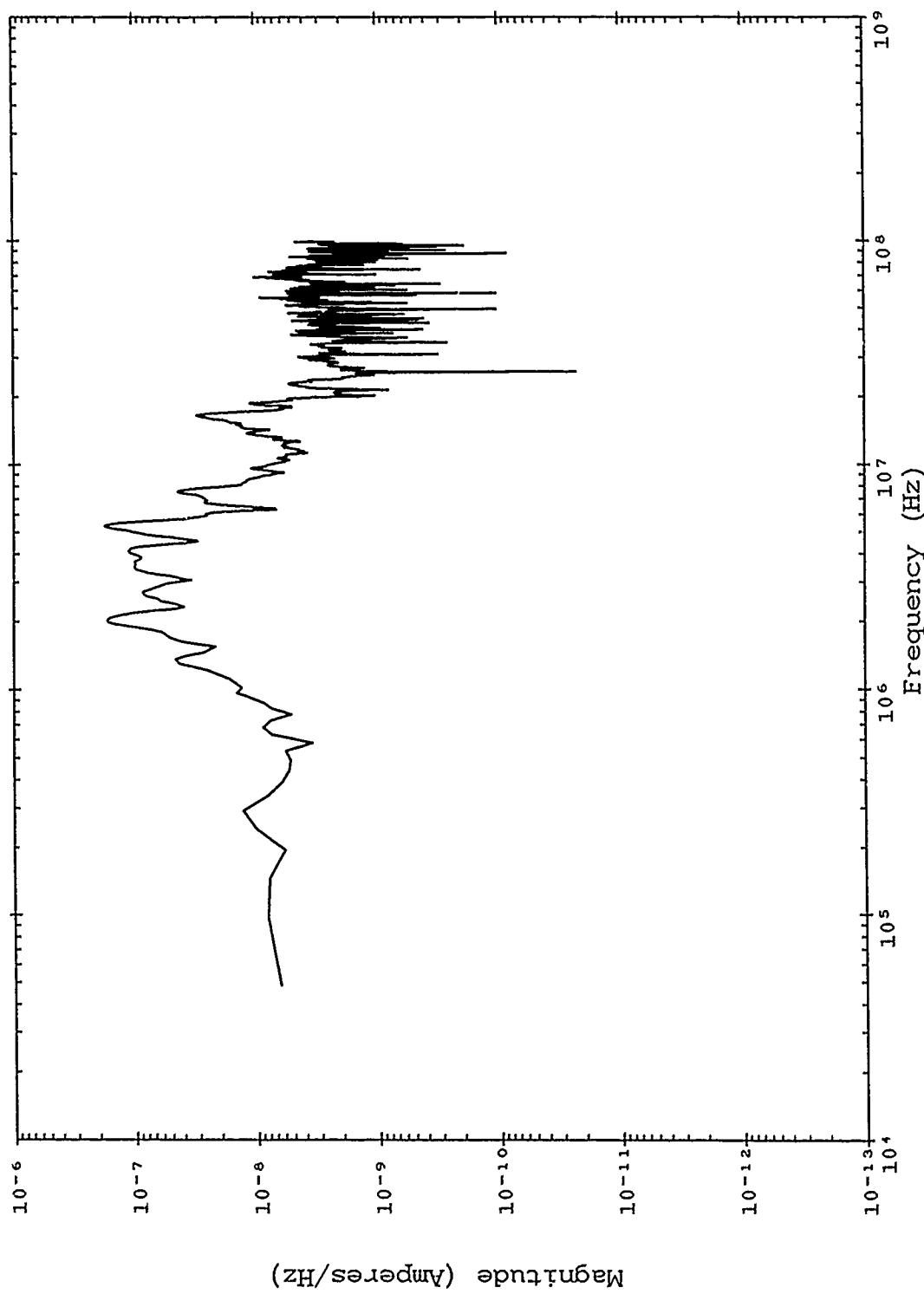


Figure B-323. Double exponential threat; TP 6381 SN 1151.

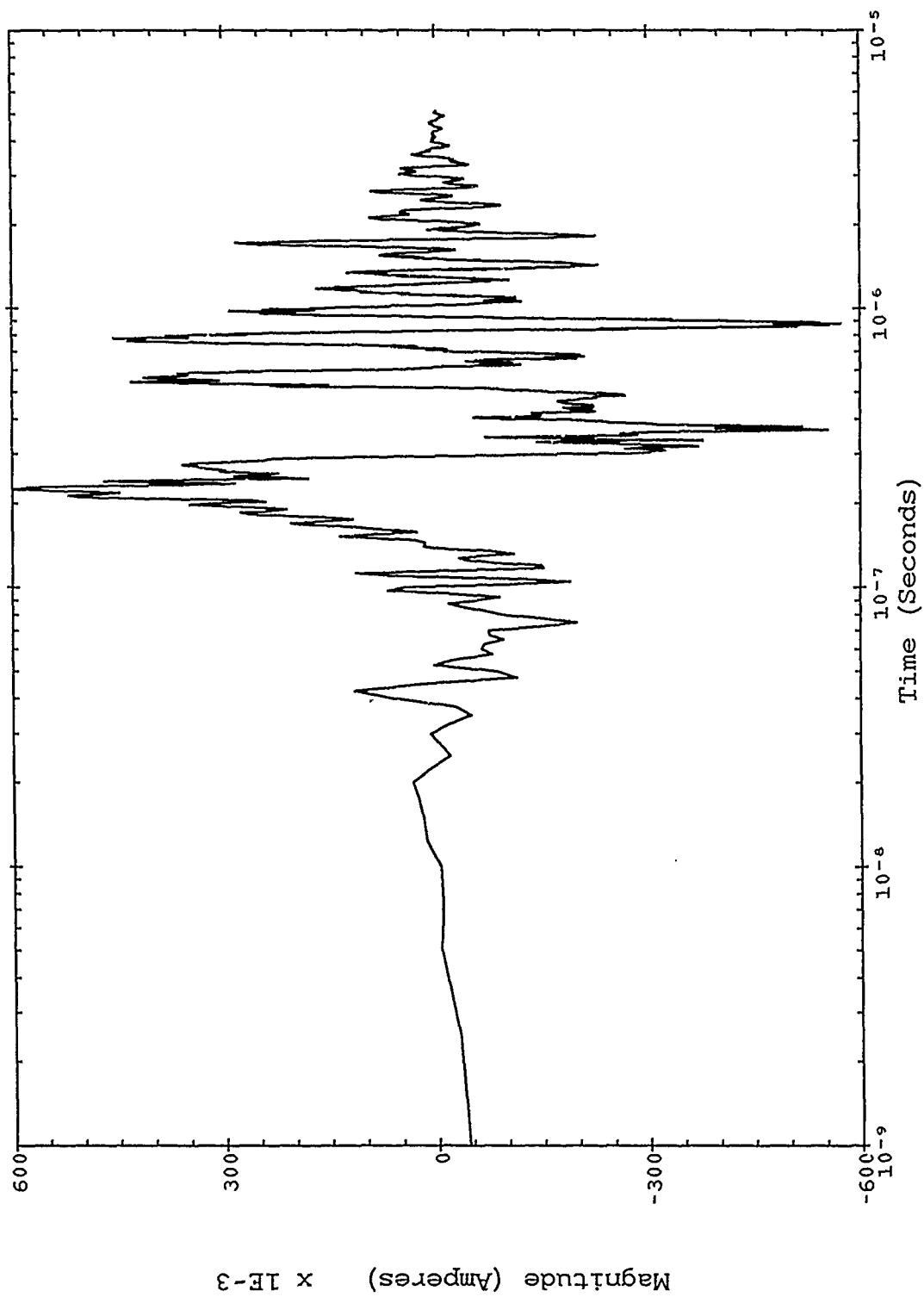


Figure B-324. Double exponential threat; TP 6381 SN 1151.

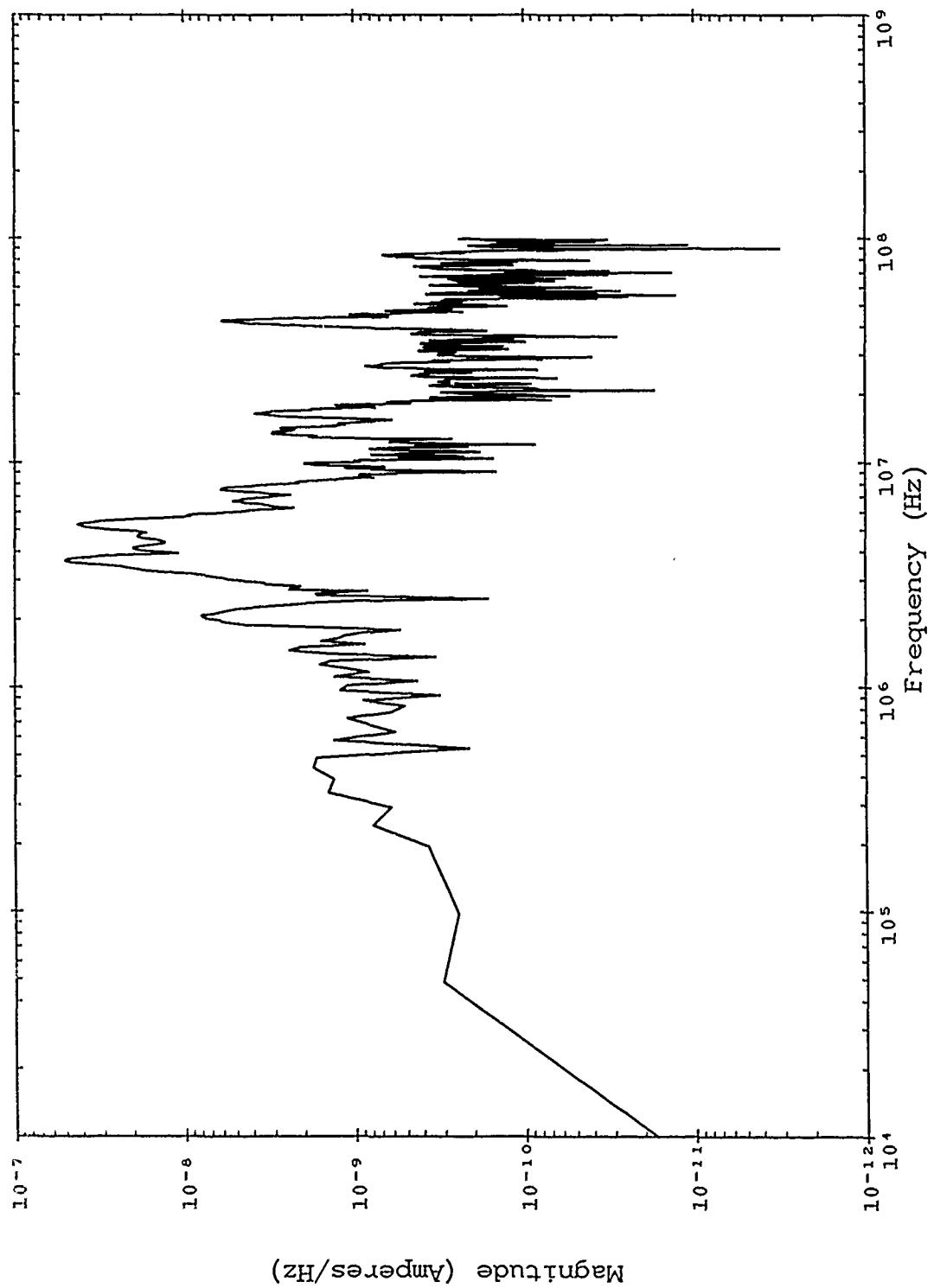


Figure B-325. Corrected TRESTLE data; TP 6482 SN 2501.

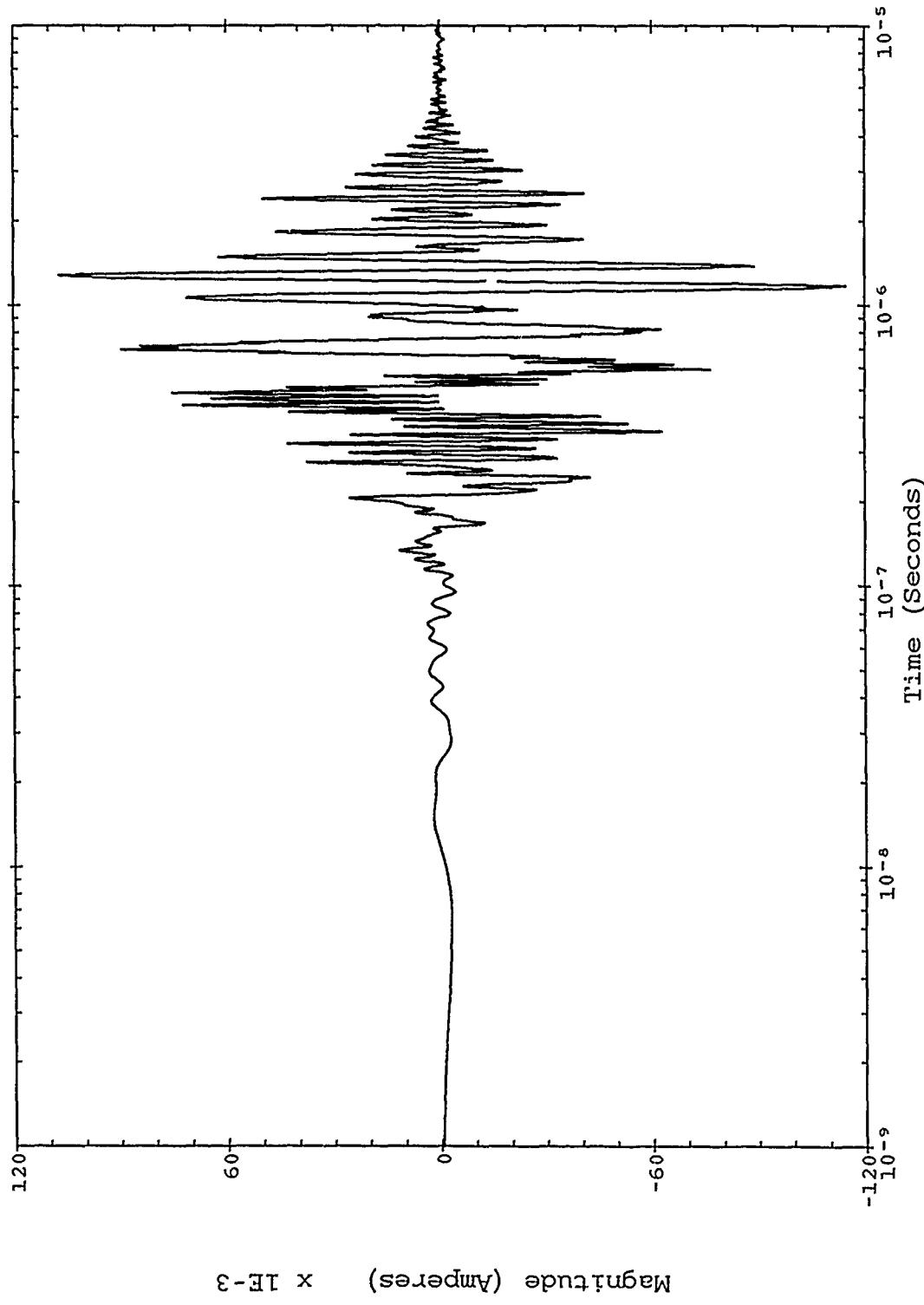


Figure B-326. Corrected TRESTLE data; TP 6482 SN 2501.

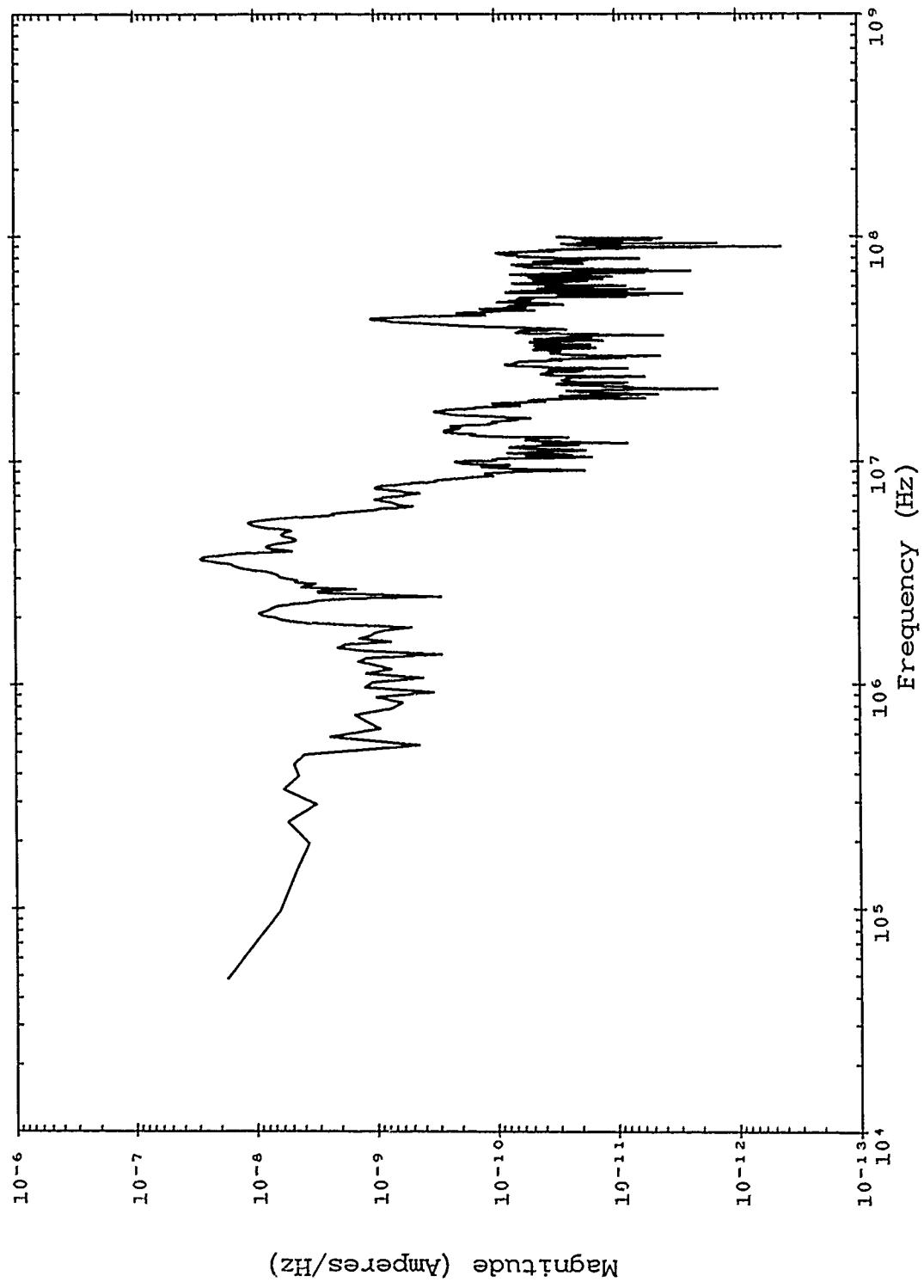


Figure B-327. Severe nearby lightning threat; TP 6482 SN 2501.

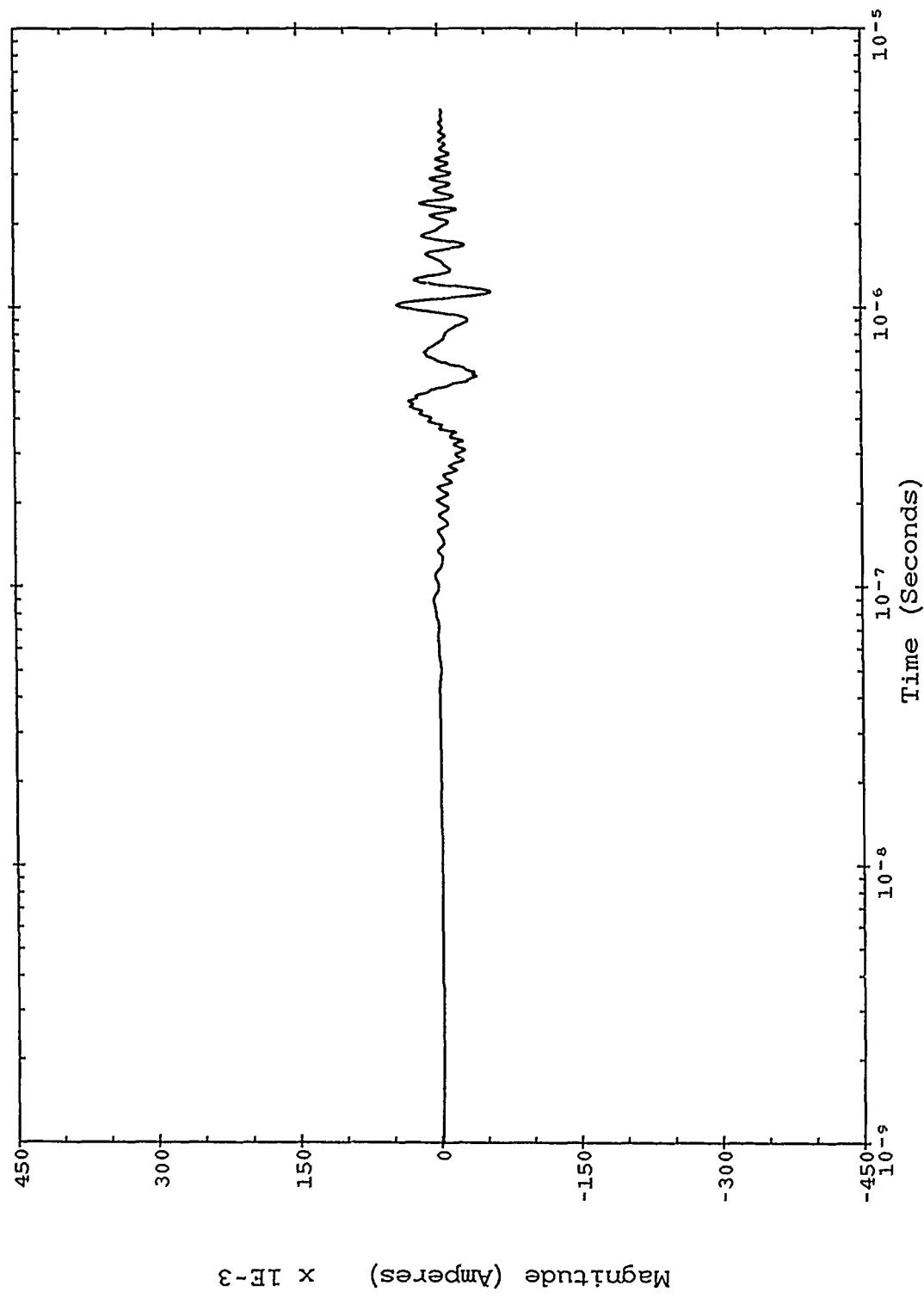


Figure B-328. Severe nearby lightning threat; IP 6482 SN 2501.

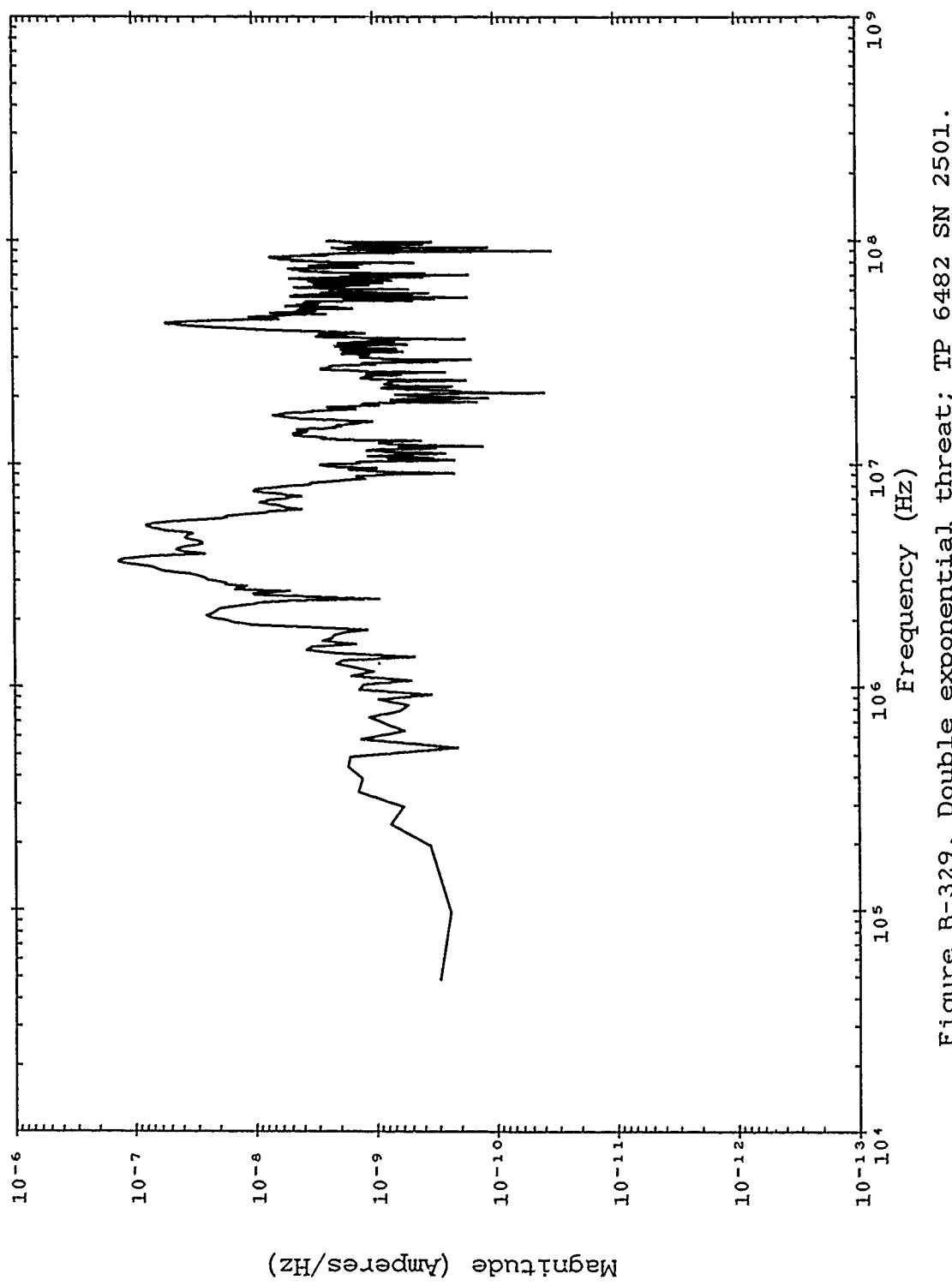


Figure B-329. Double exponential threat; TP 6482 SN 2501.

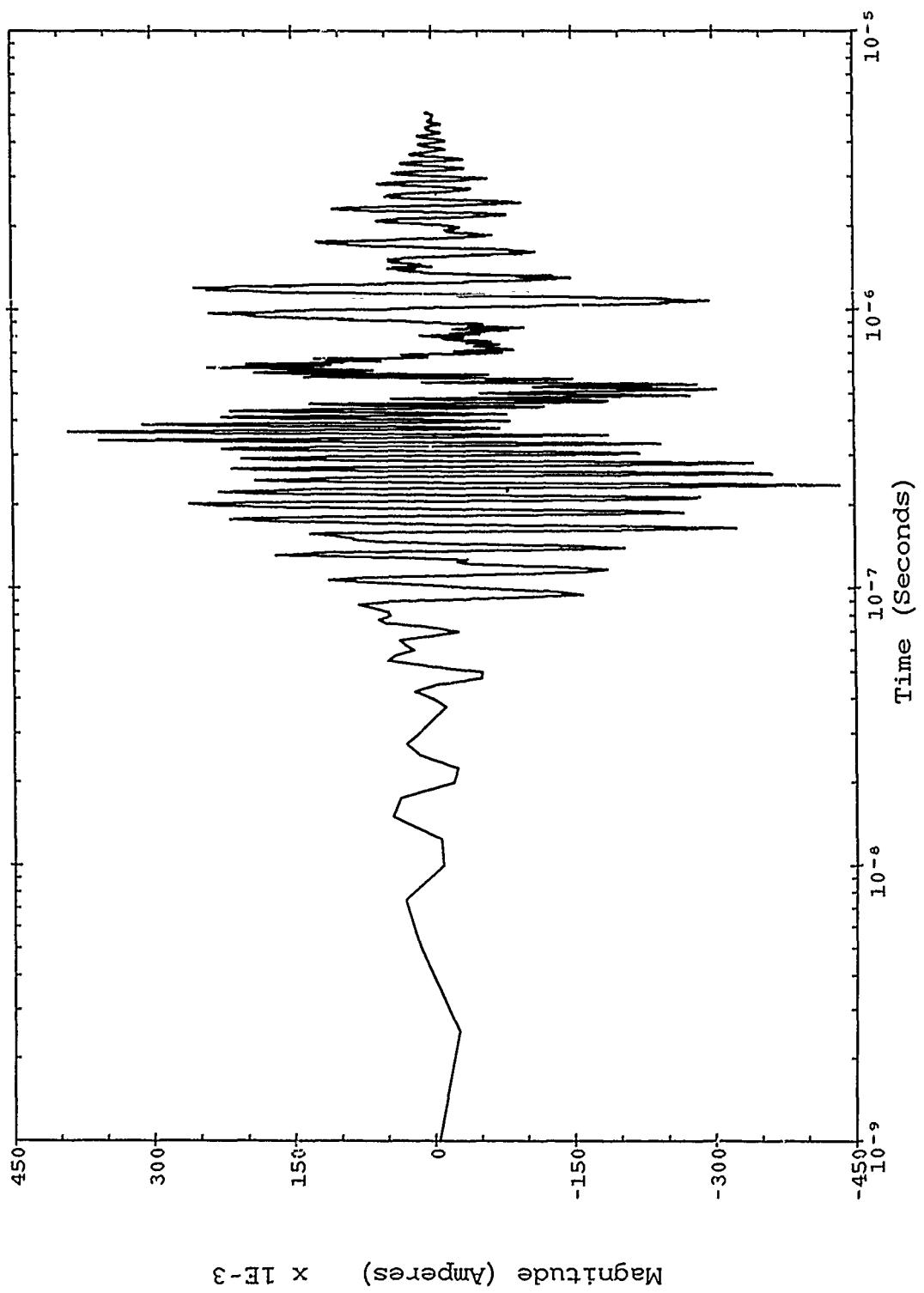


Figure B-330. Double exponential threat; TP 6482 SN 2501.

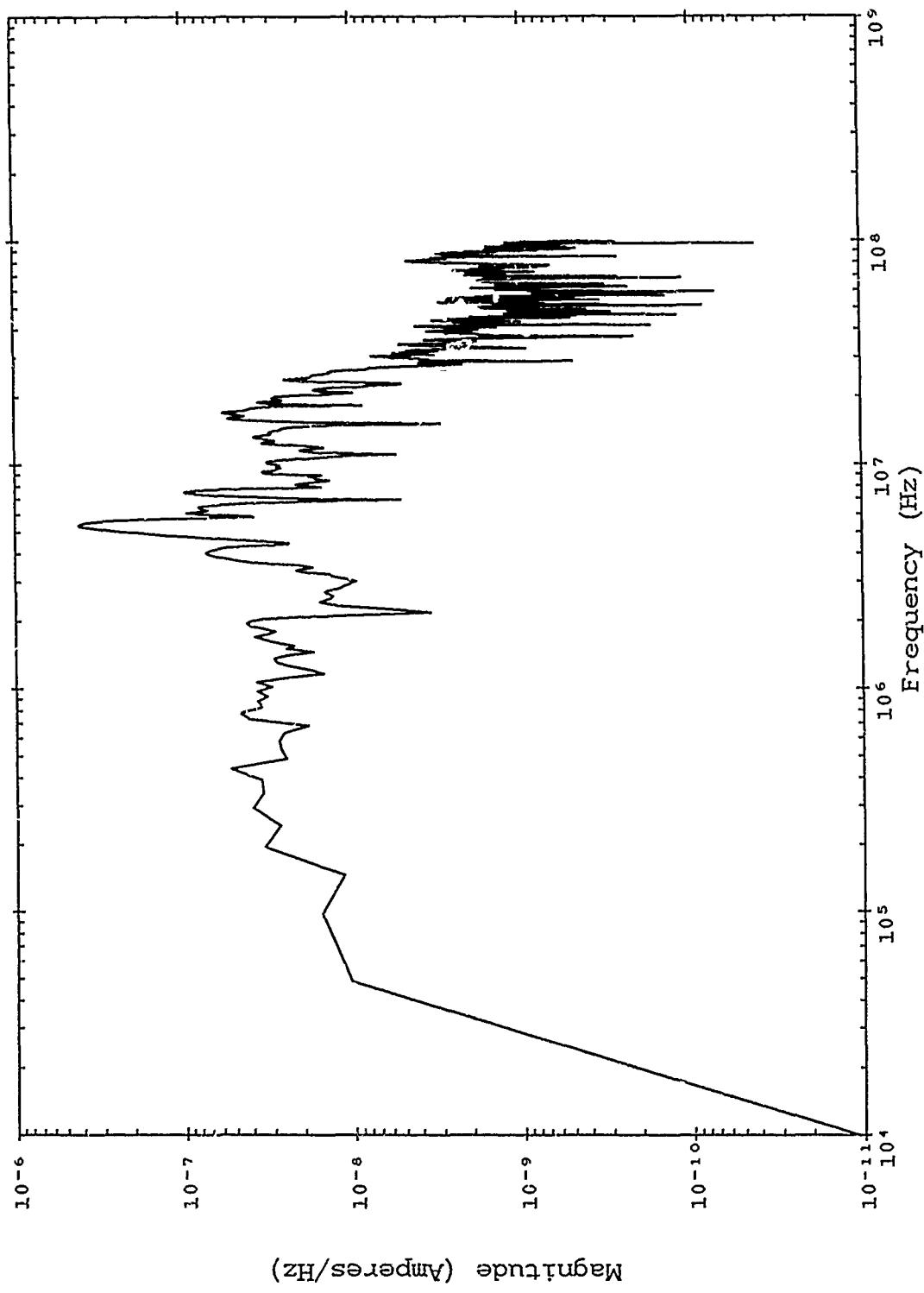


Figure B-331. Corrected TRESTLE data; TP 6562 SN 2501.

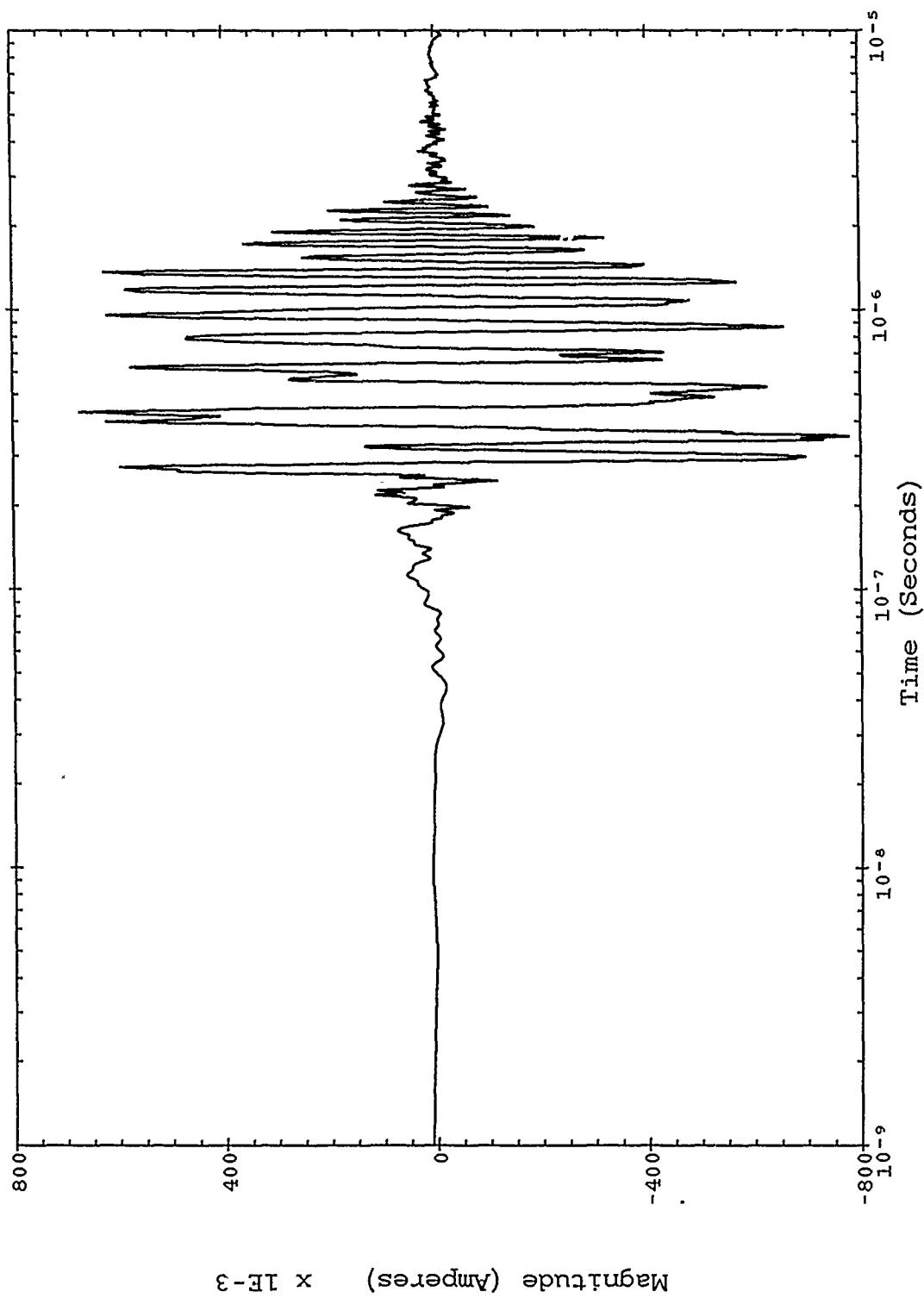


Figure B-332. Corrected TRESTLE data; TP 6562 SN 2501.

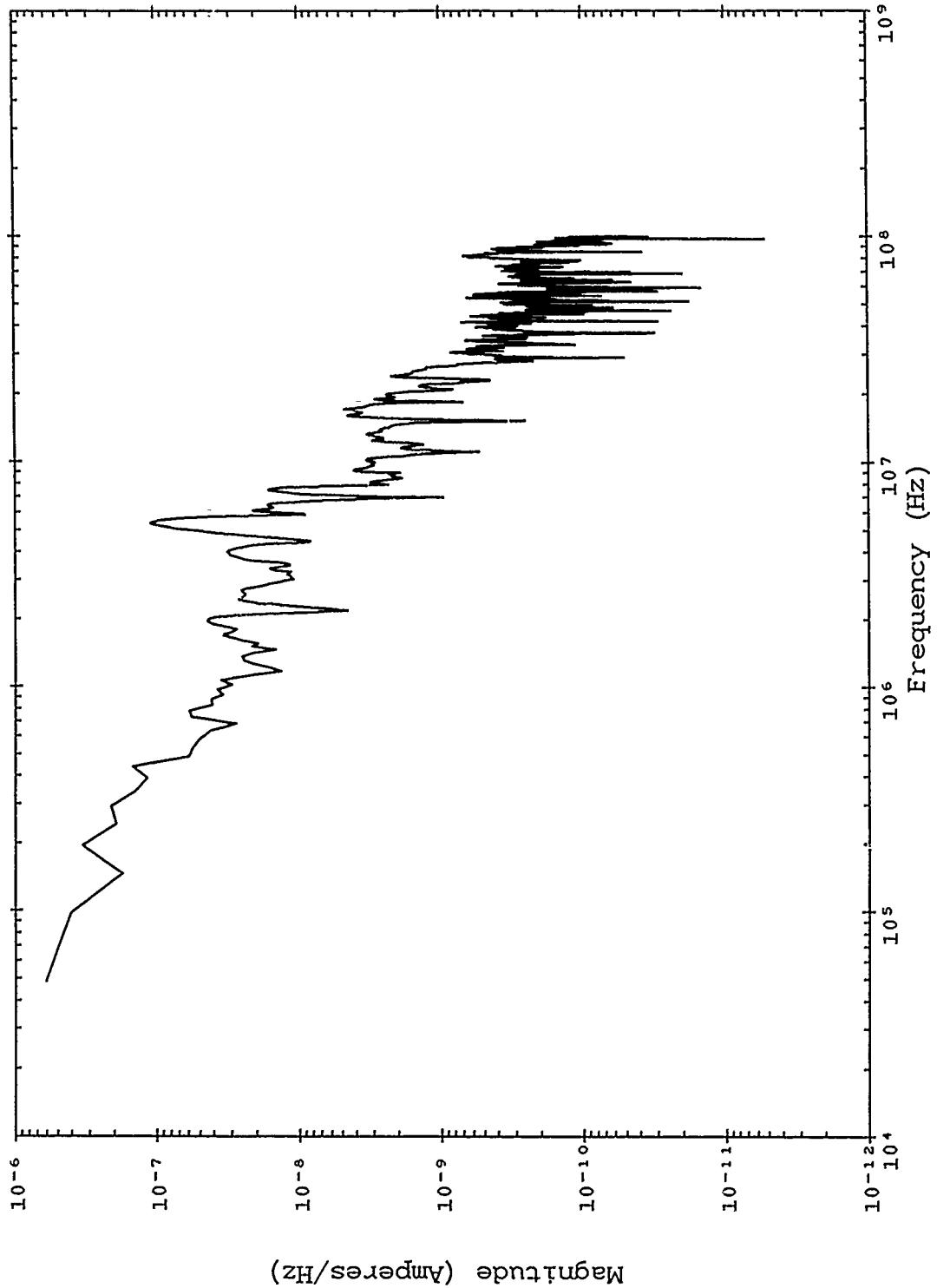


Figure B-333. Severe nearby lightning threat; TP 6562 SN 2501.

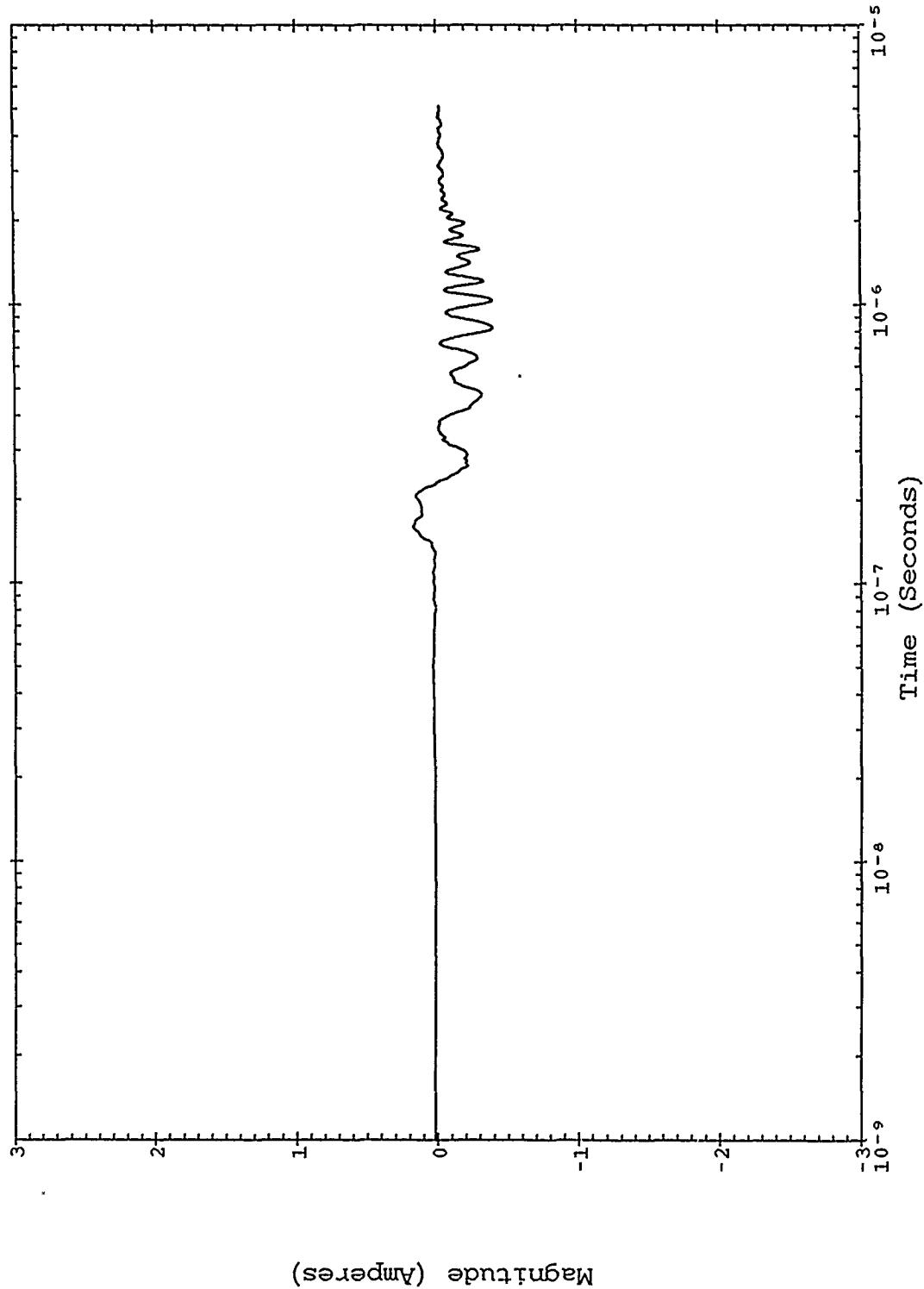


Figure B-334. Severe nearby lightning threat; TP 6562 SN 2501.

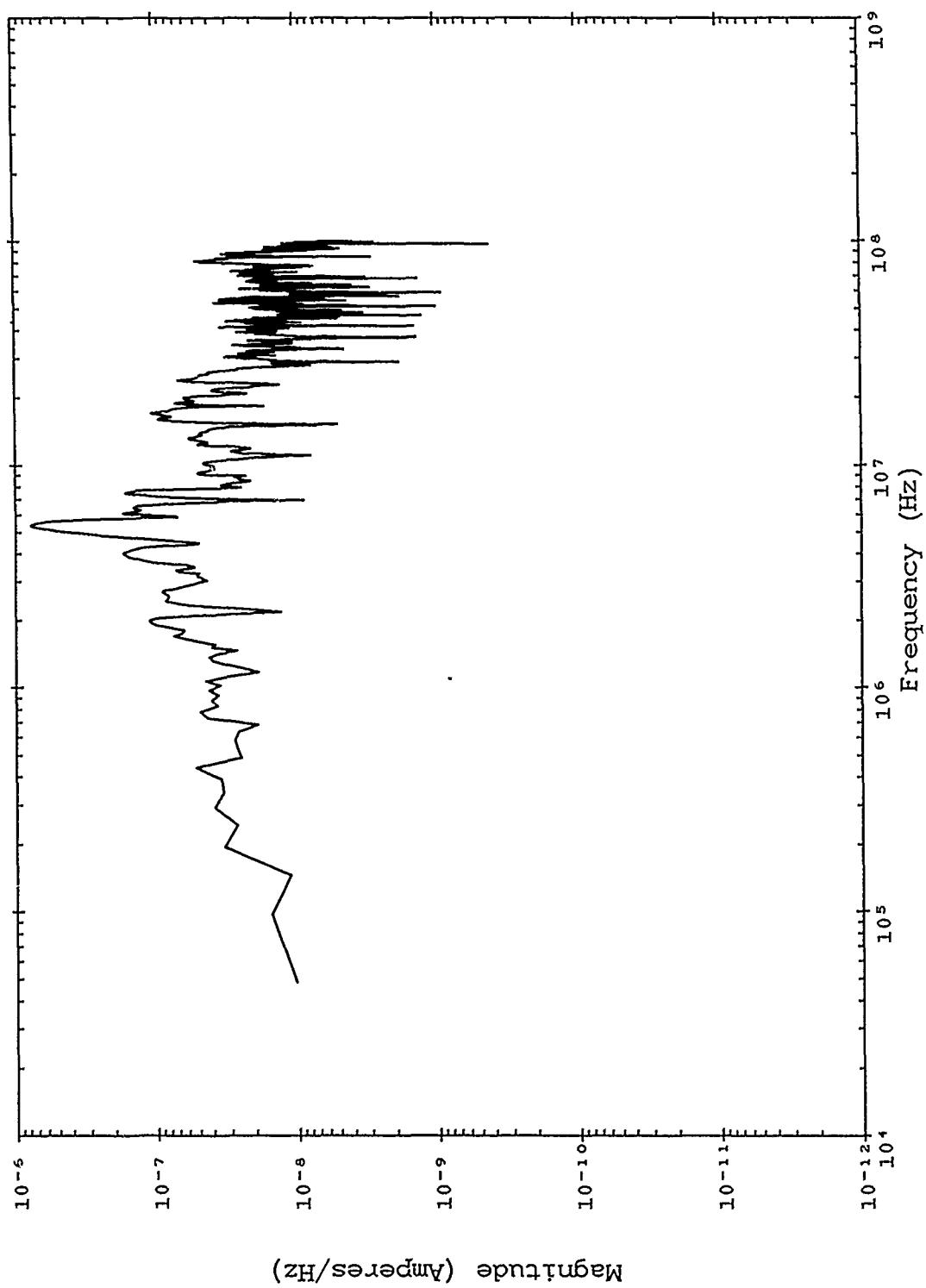


Figure B-335. Double exponential threat; TP 6562 SN 2501.

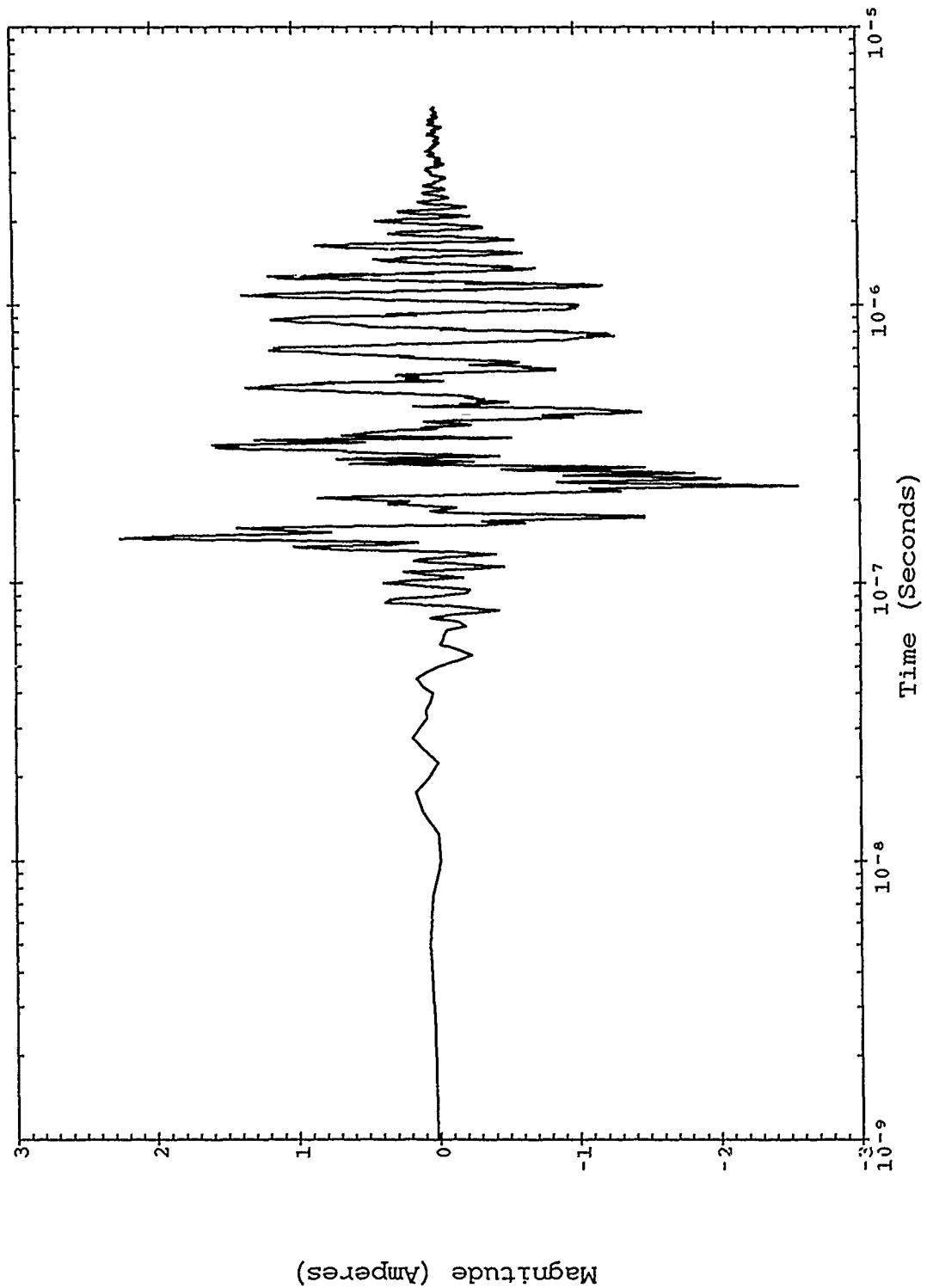


Figure B-336. Double exponential threat; TP 6562 SN 2501.

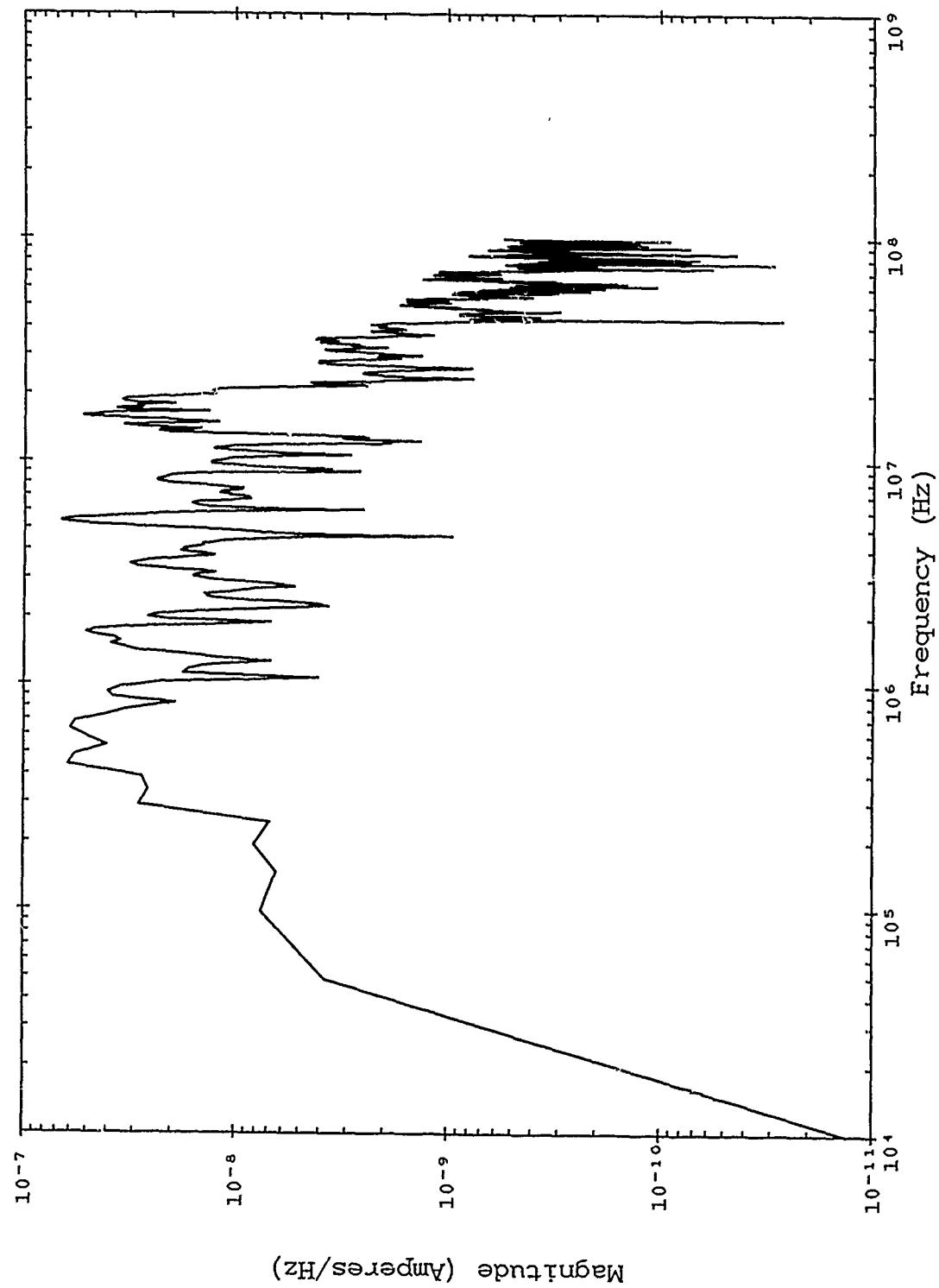


Figure B-337. Corrected TRESTLE data; TP 6708 SN 2712.

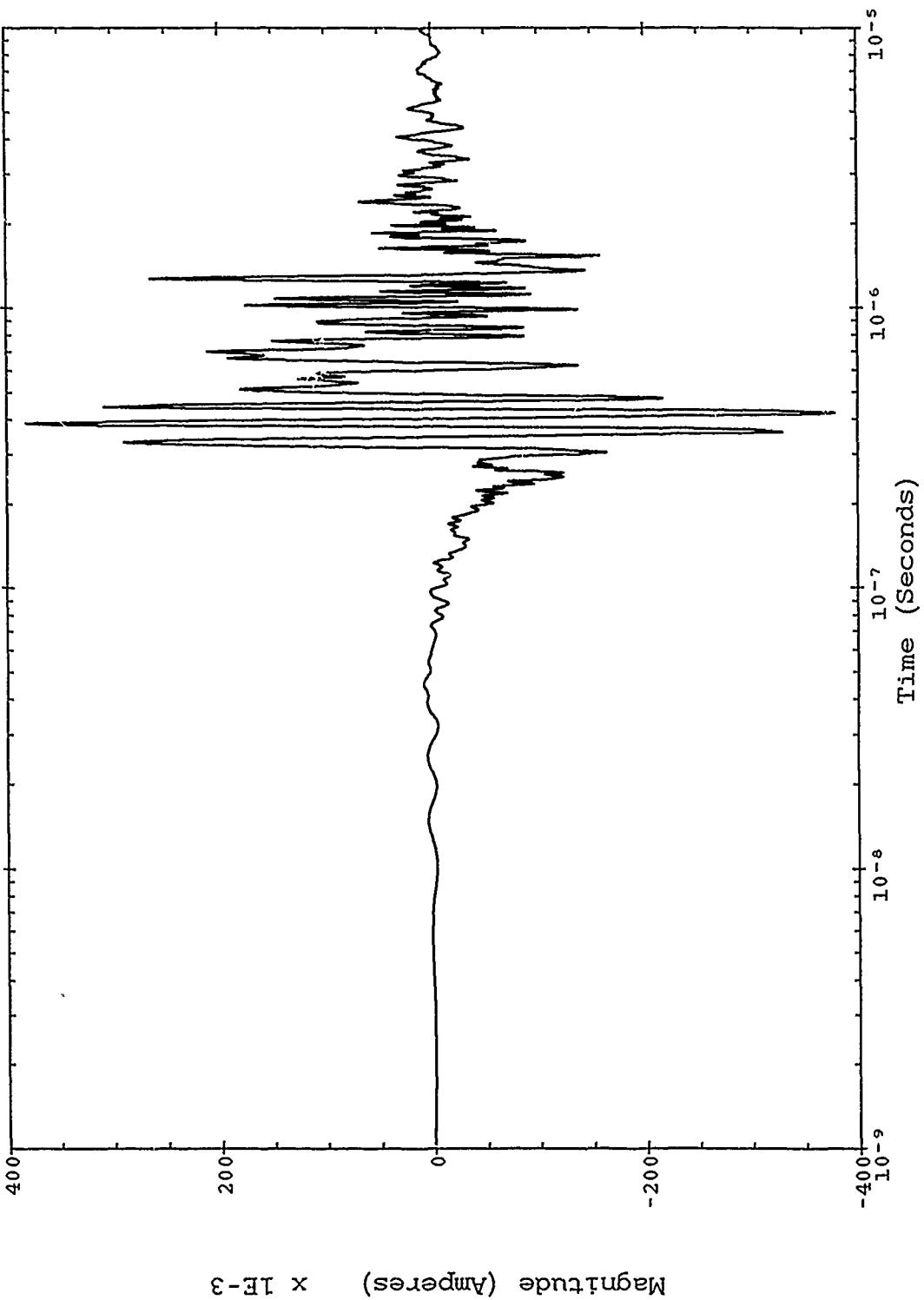


Figure B-338. Corrected TREESTLE data; TP 6708 SN 2712.

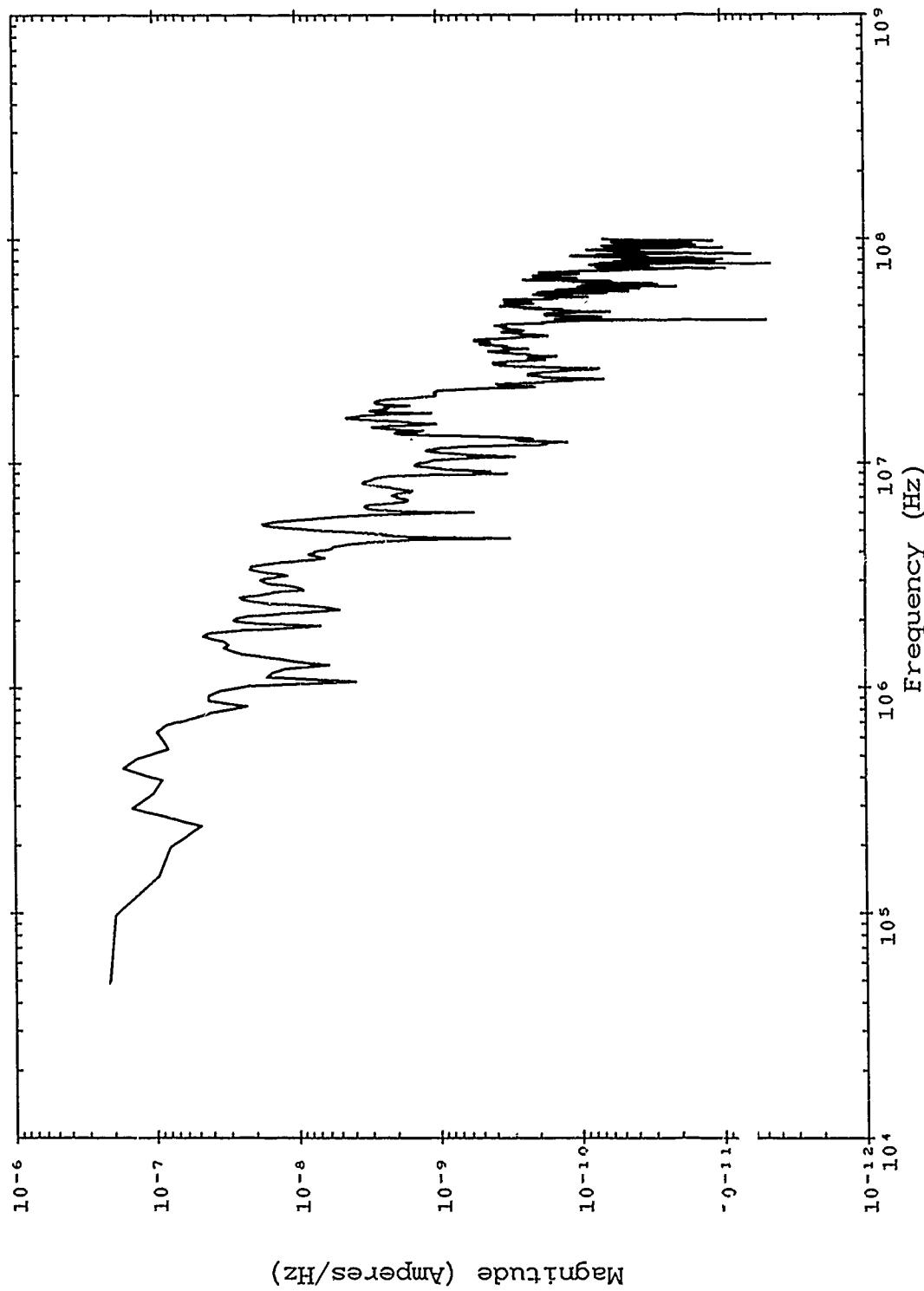


Figure B-339. Severe nearby lightning threat; TP 6708 SN 2712.

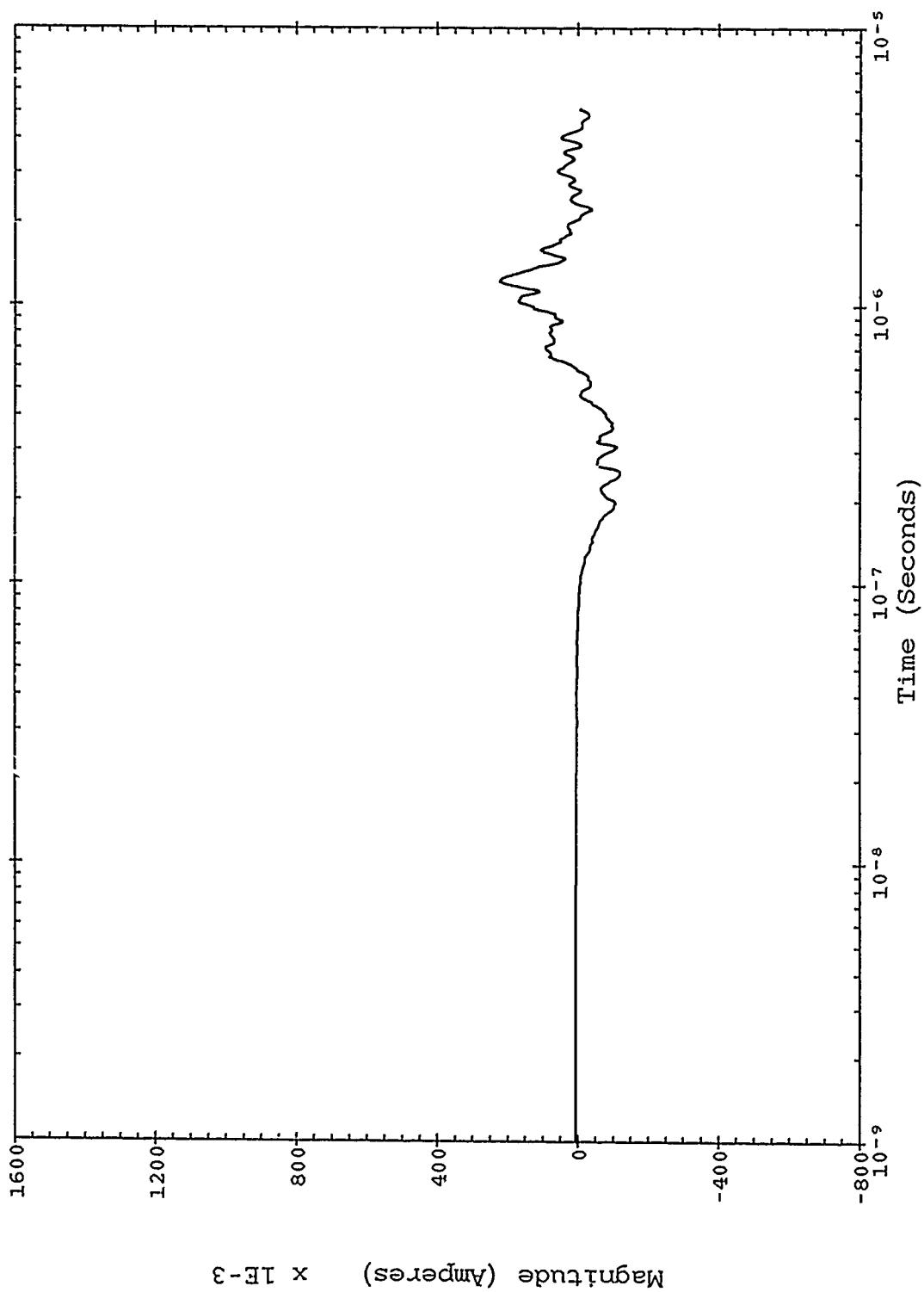


Figure B-340. Severe nearby lightning threat; TP 6708 SN 2712.

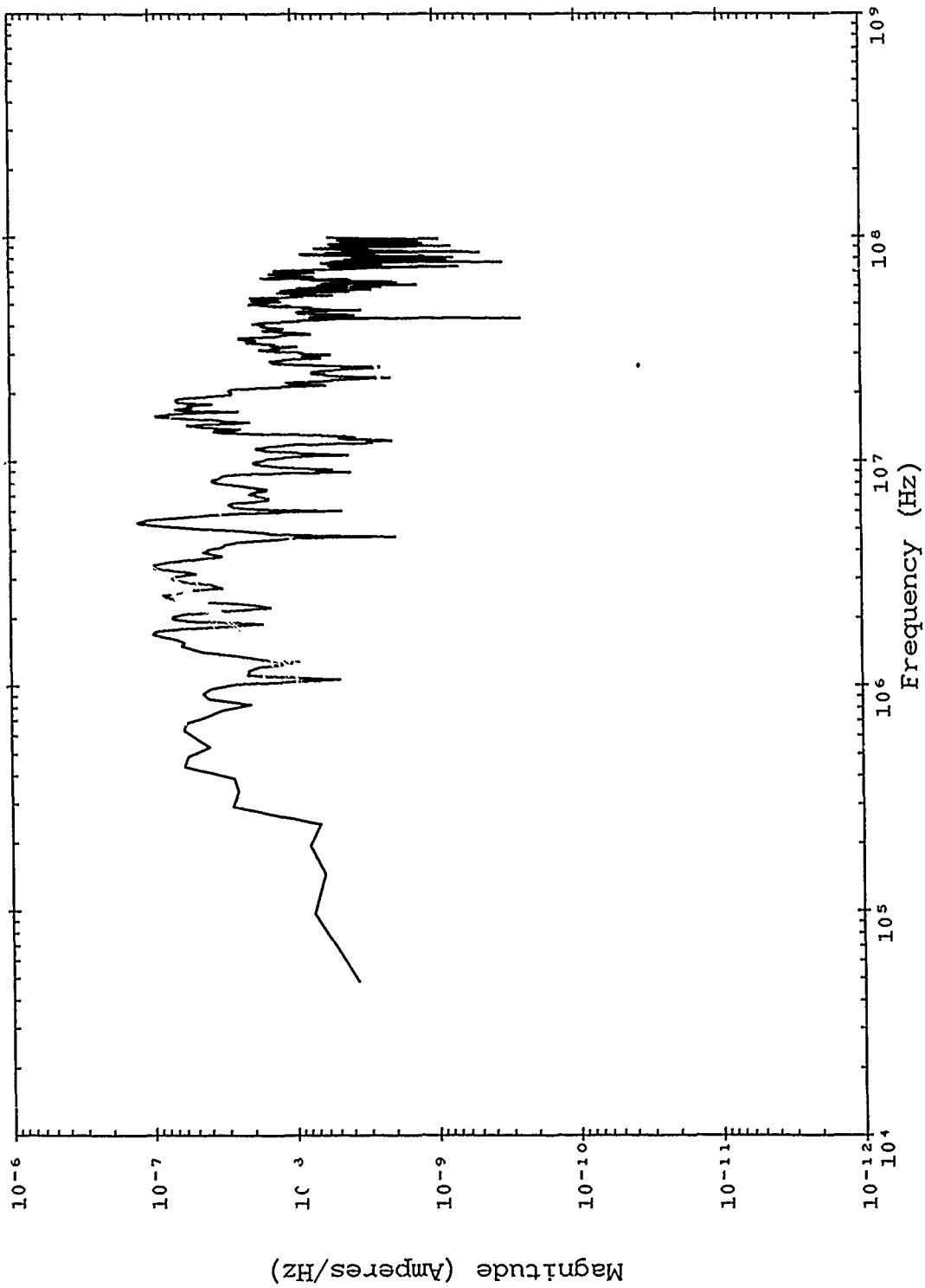


Figure B-341. Double exponential threat; TP 6708 SN 2712.

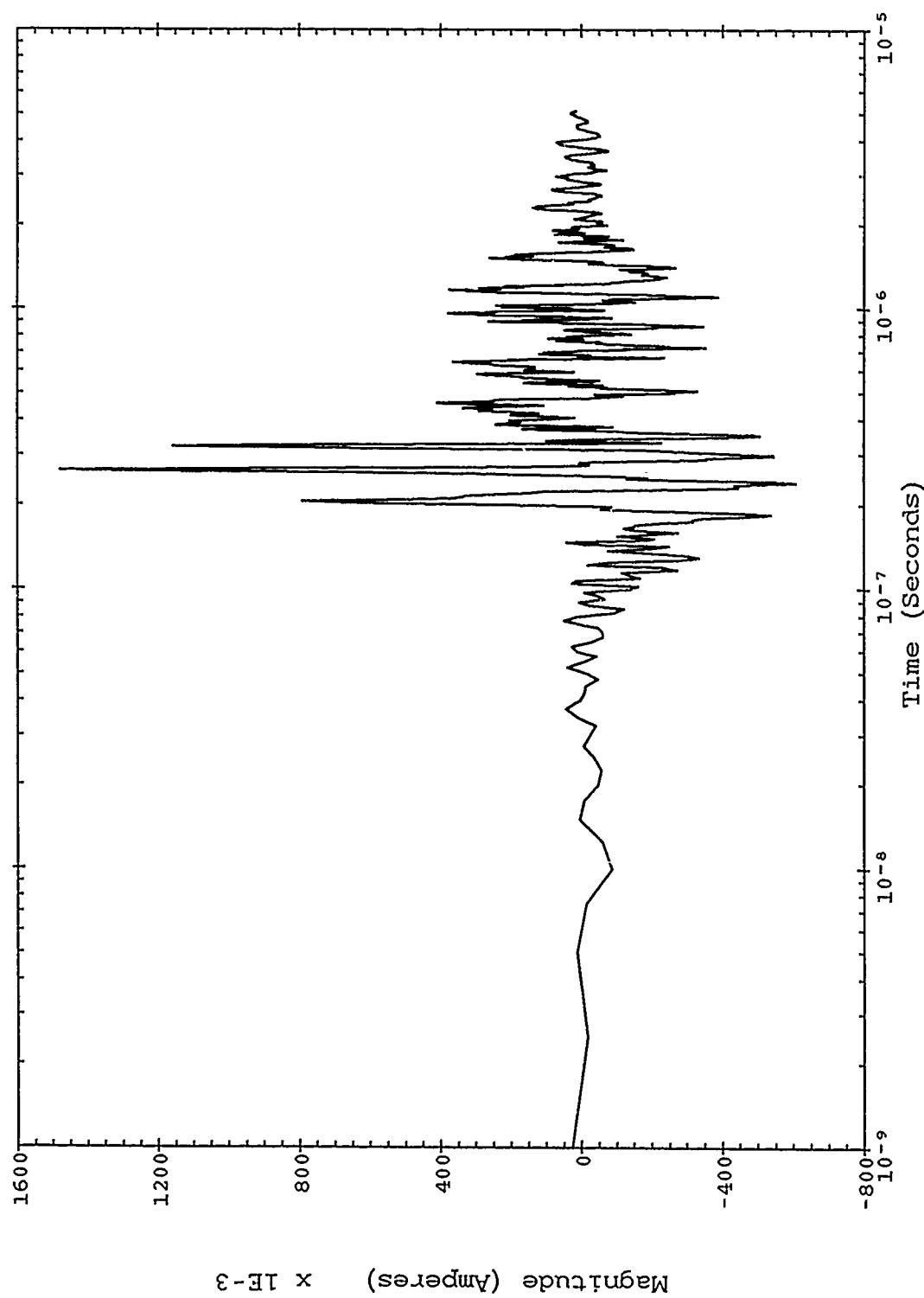


Figure B-342. Double exponential threat; TP 6708 SN 2712.

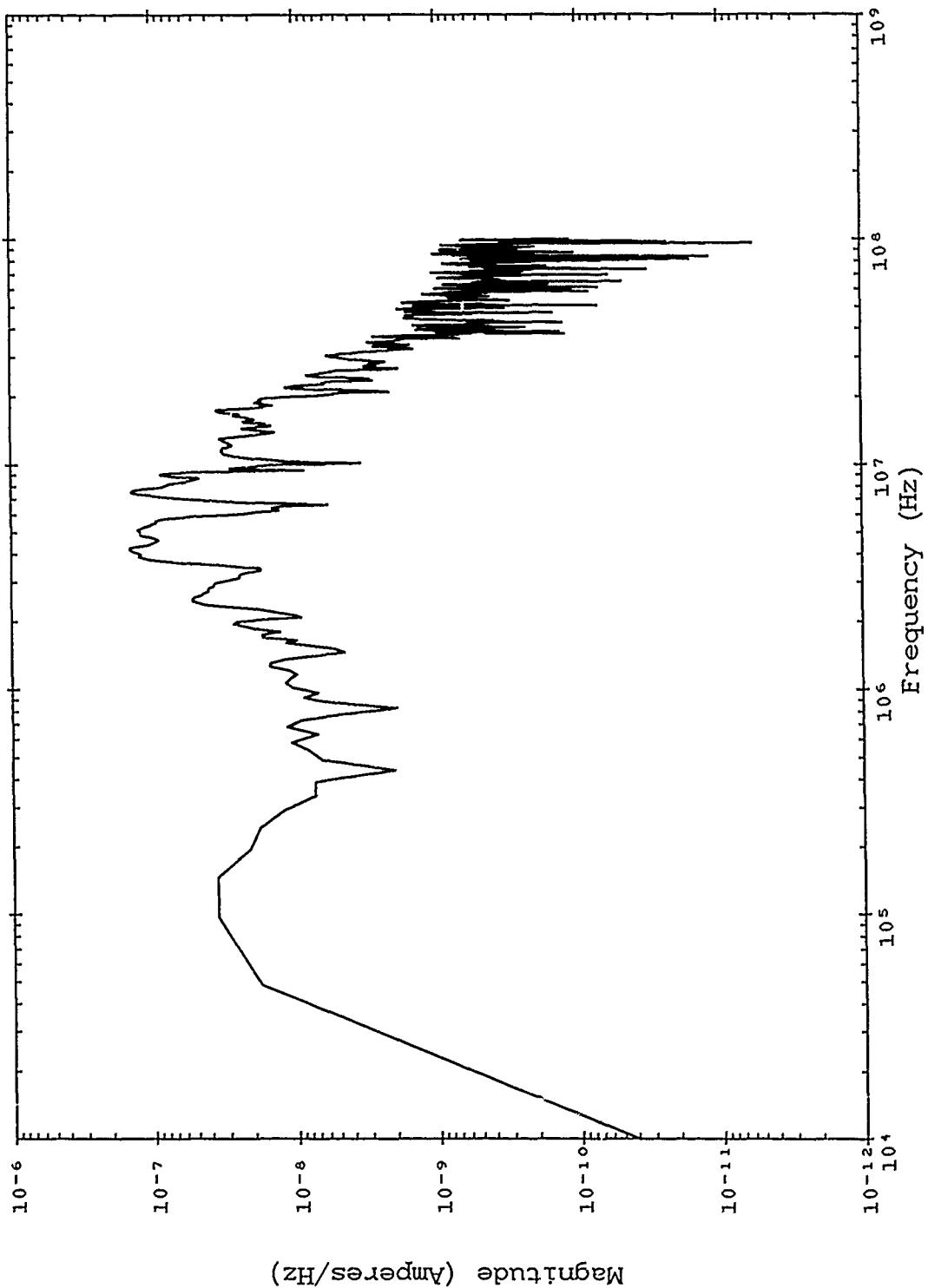


Figure B-343. Corrected TRESTLE data; TP 6732 SN 2712.

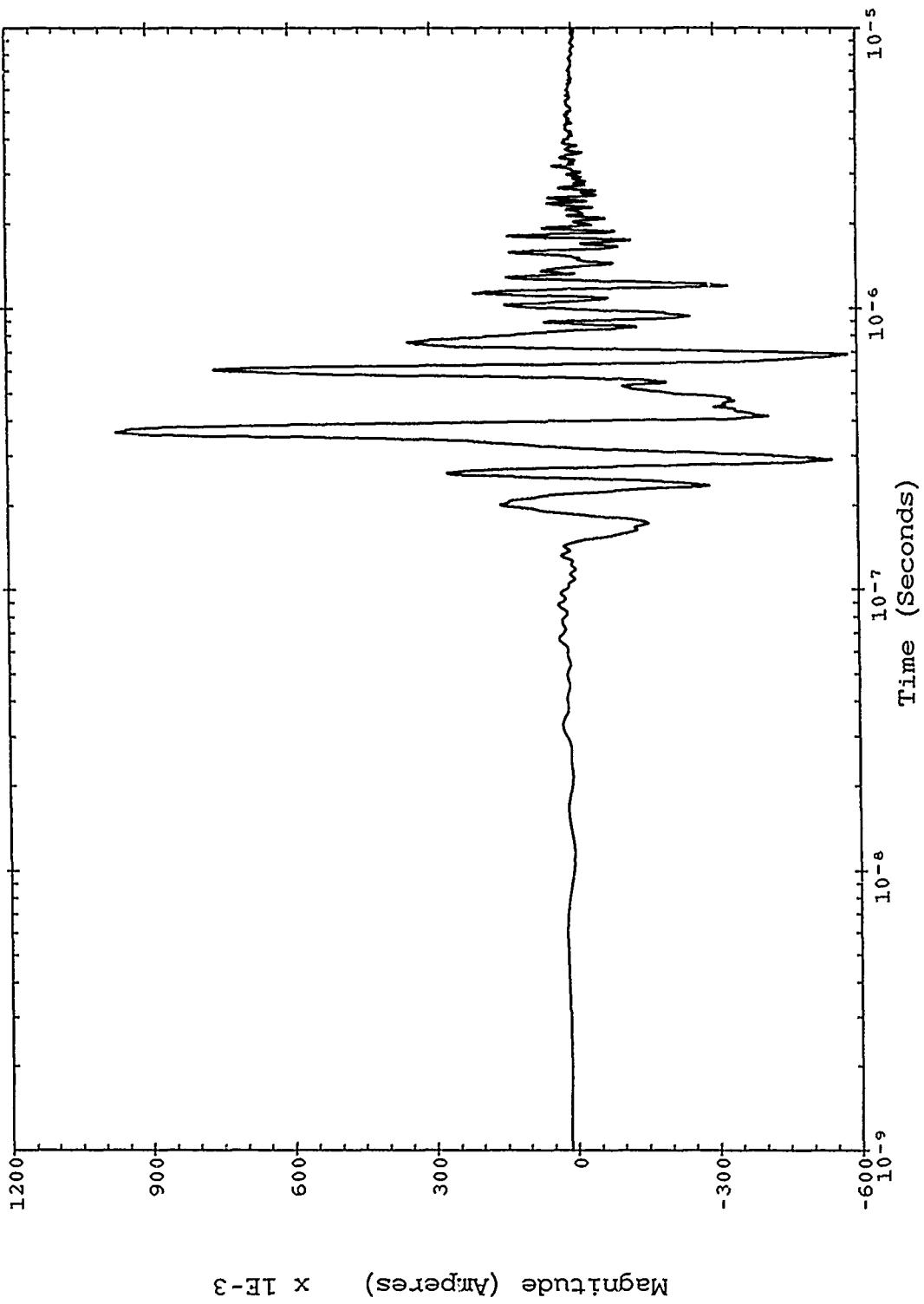


Figure B-344. Corrected TRESTLE data; TP 6732 SN 2712.

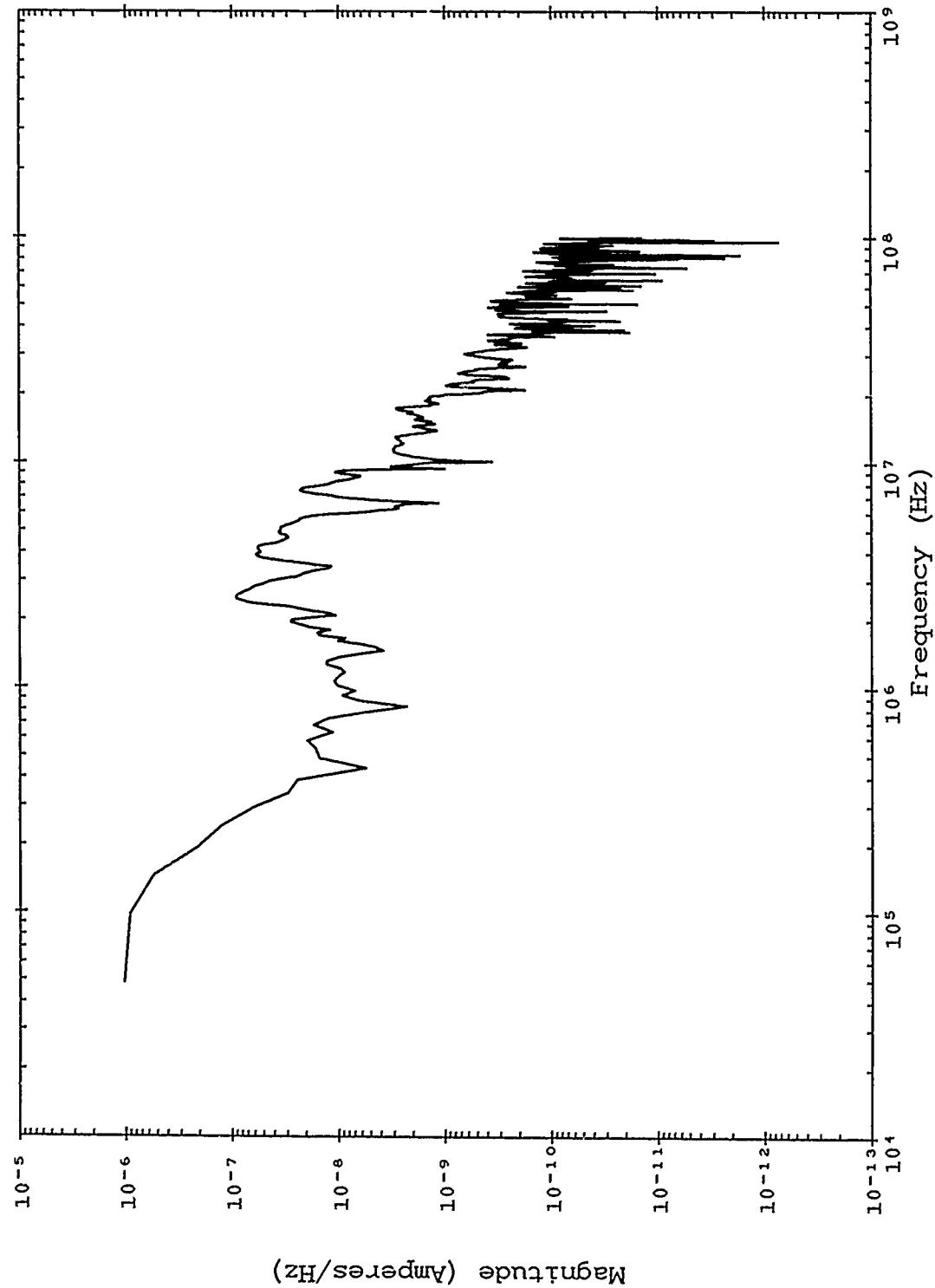


Figure B-345. Severe nearby lightning threat; TP 6732 SN 2712.

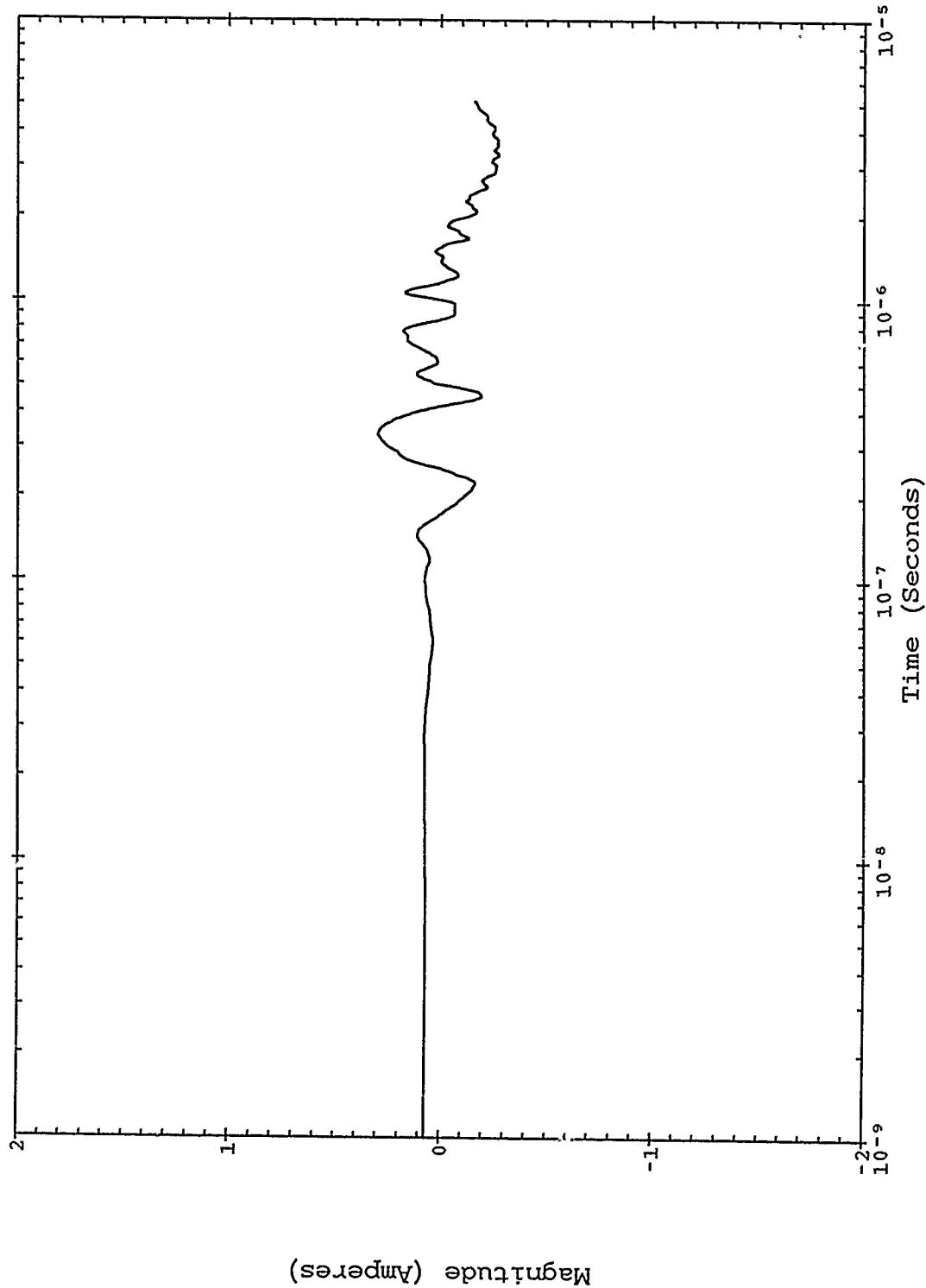


Figure B-346. Severe nearby lightning threat; TP 6732 SN 2712.

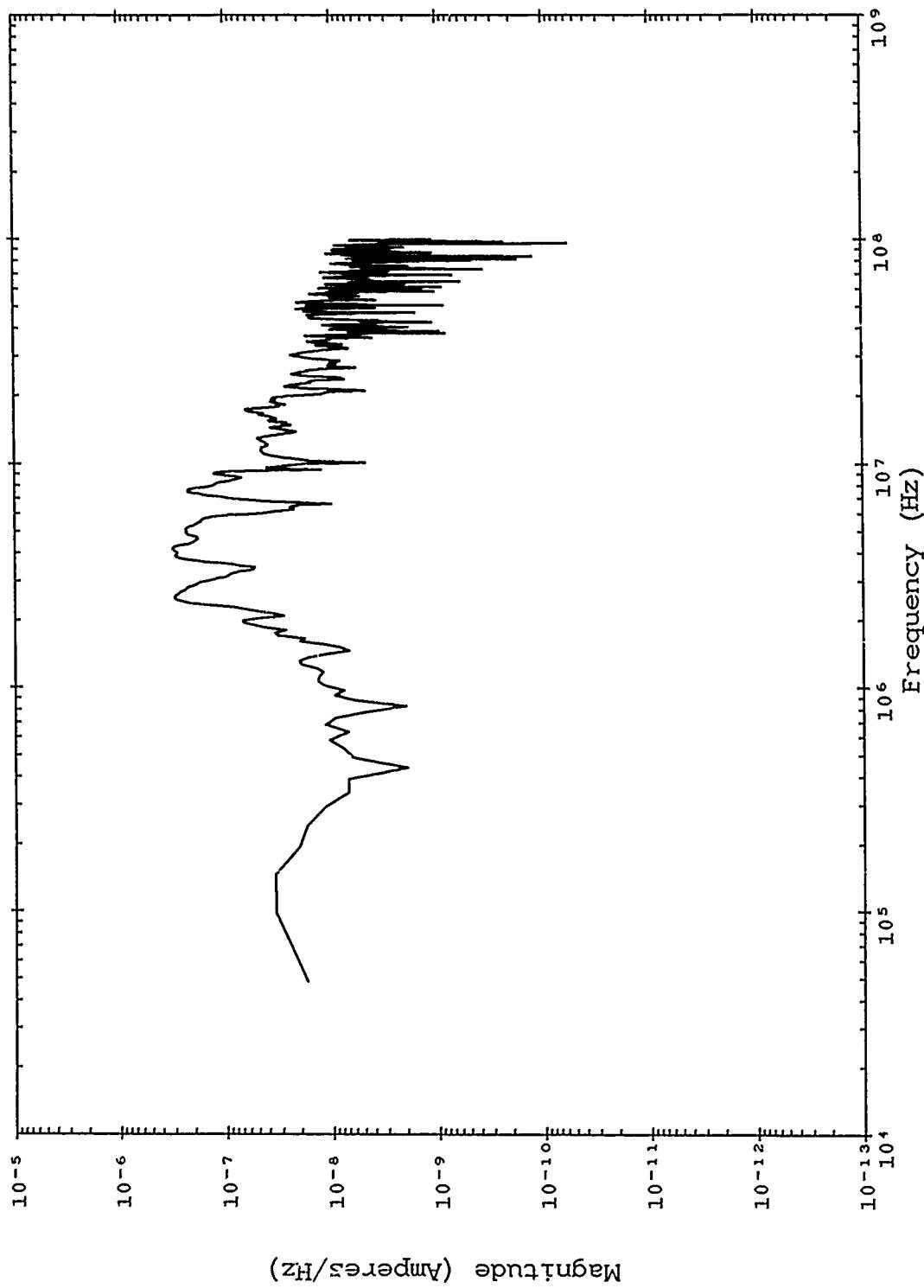


Figure B-347. Double exponential threat; TP 6732 SN 2712.

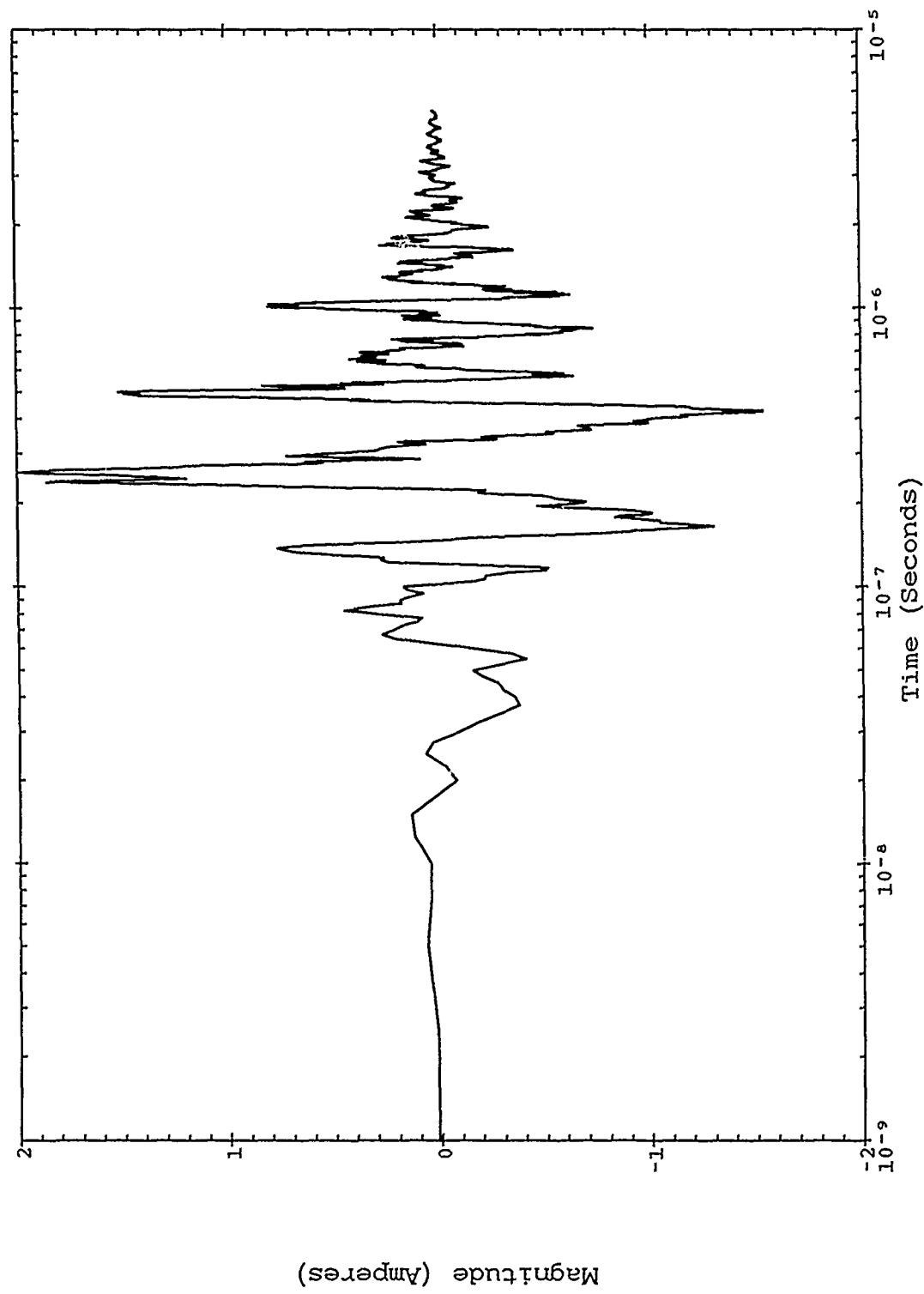


Figure B-348. Double exponential threat; TP 6732 SN 2712.

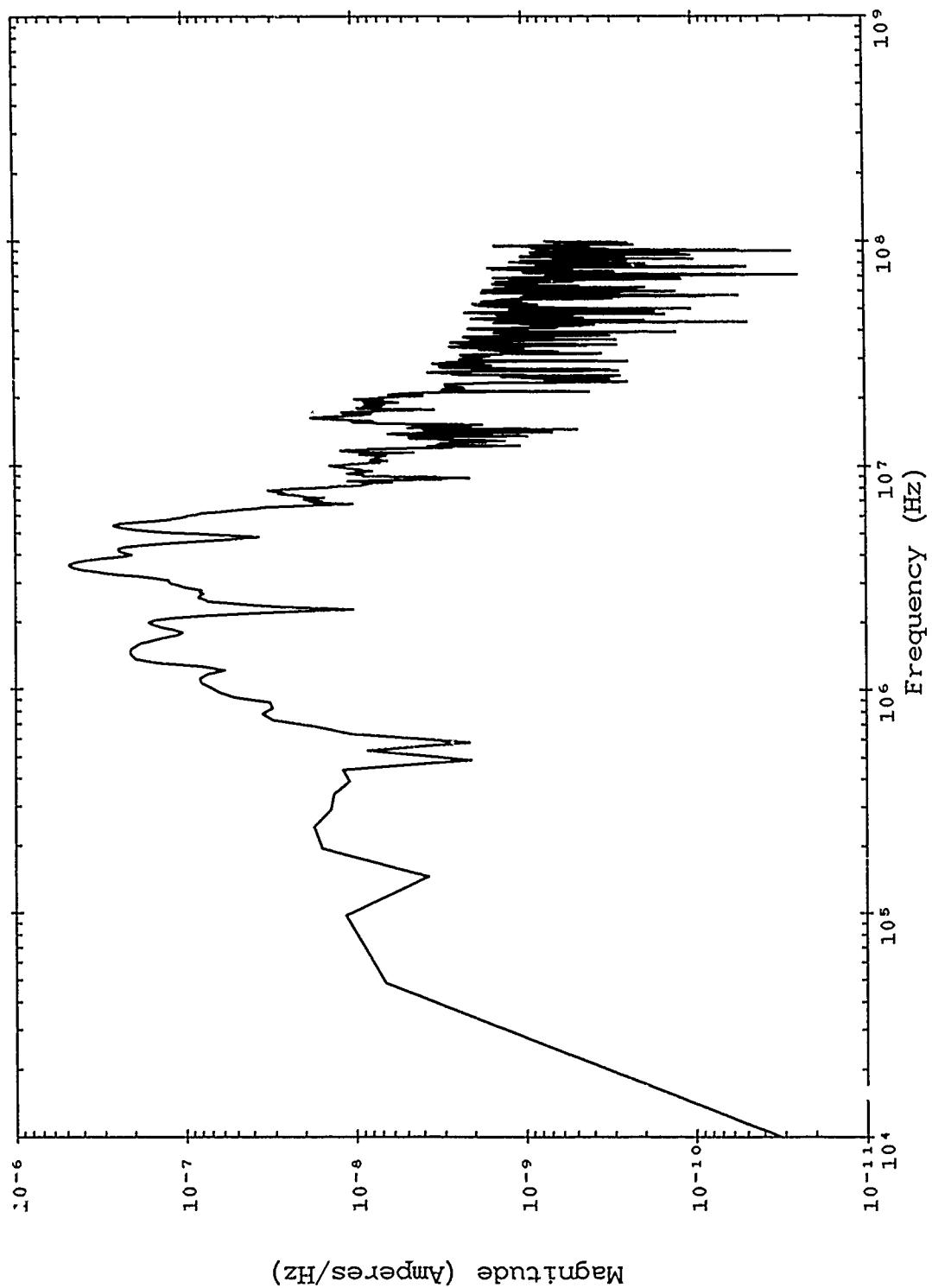


Figure B-349. Corrected TRESTLE data; TP 7045 SN 2260.

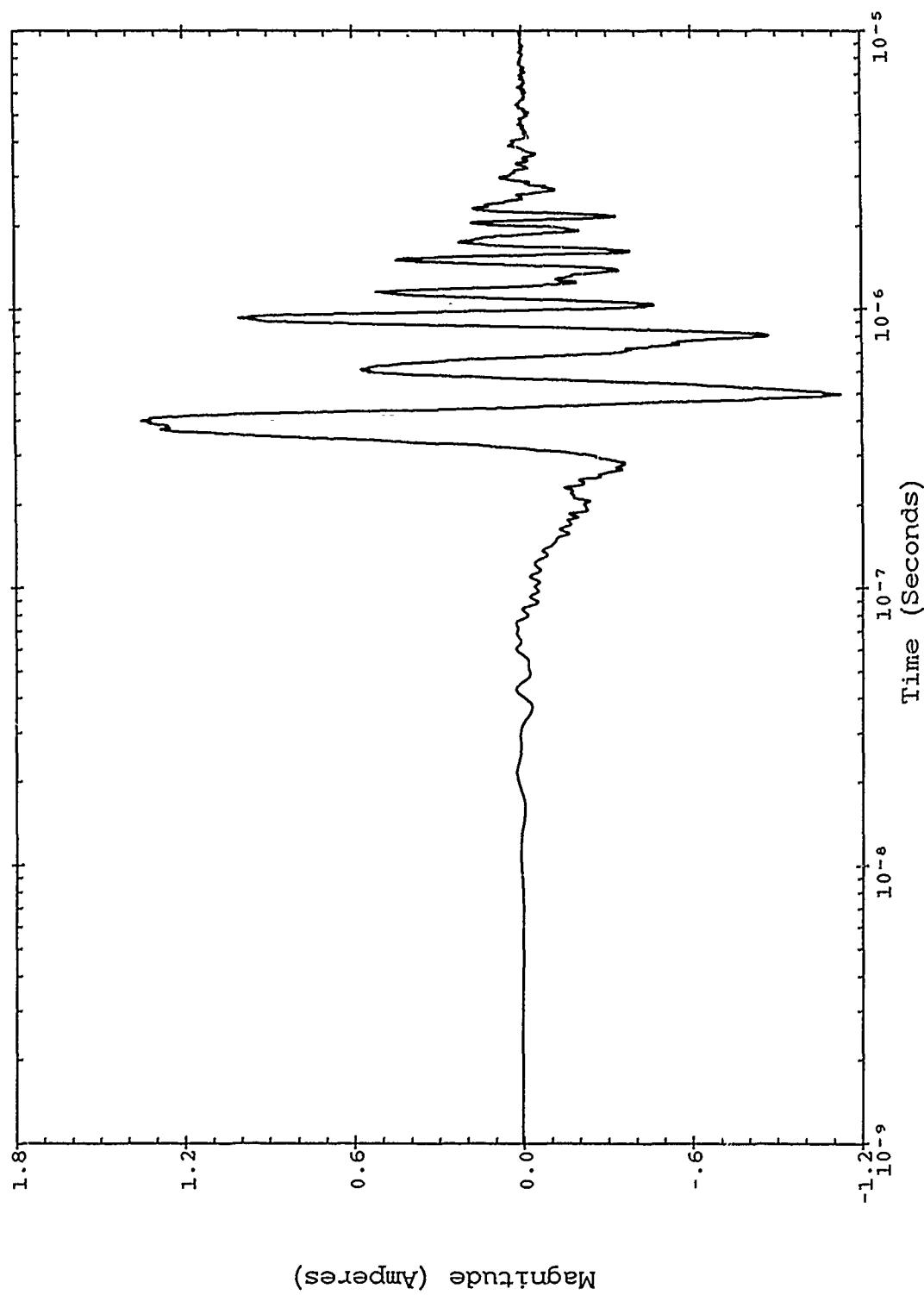


Figure B-350. Corrected TRESTLE data; TP 7045 SN 2260.

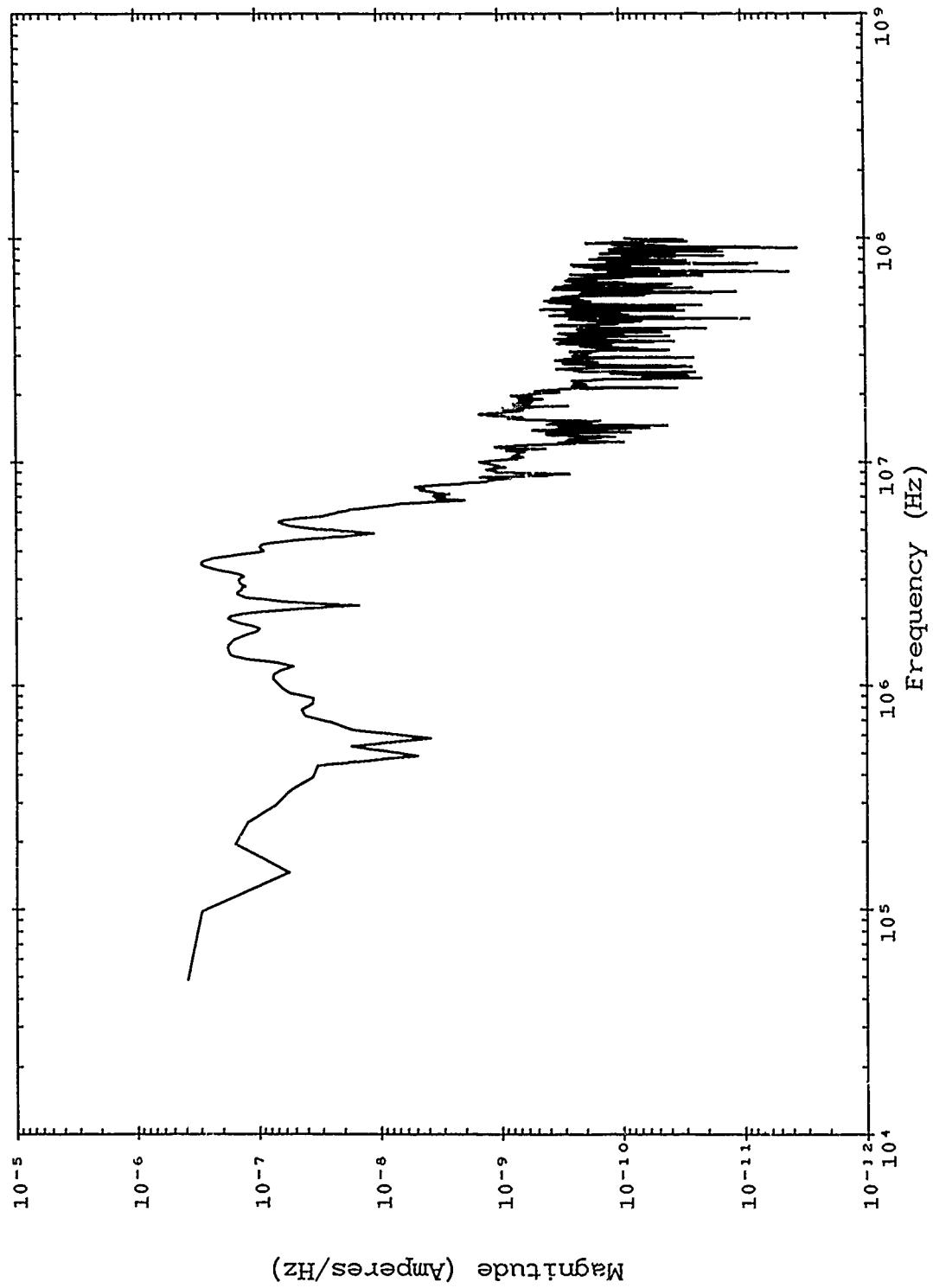


Figure B-351. Severe nearby lightning threat; TP 7045 SN 2260.

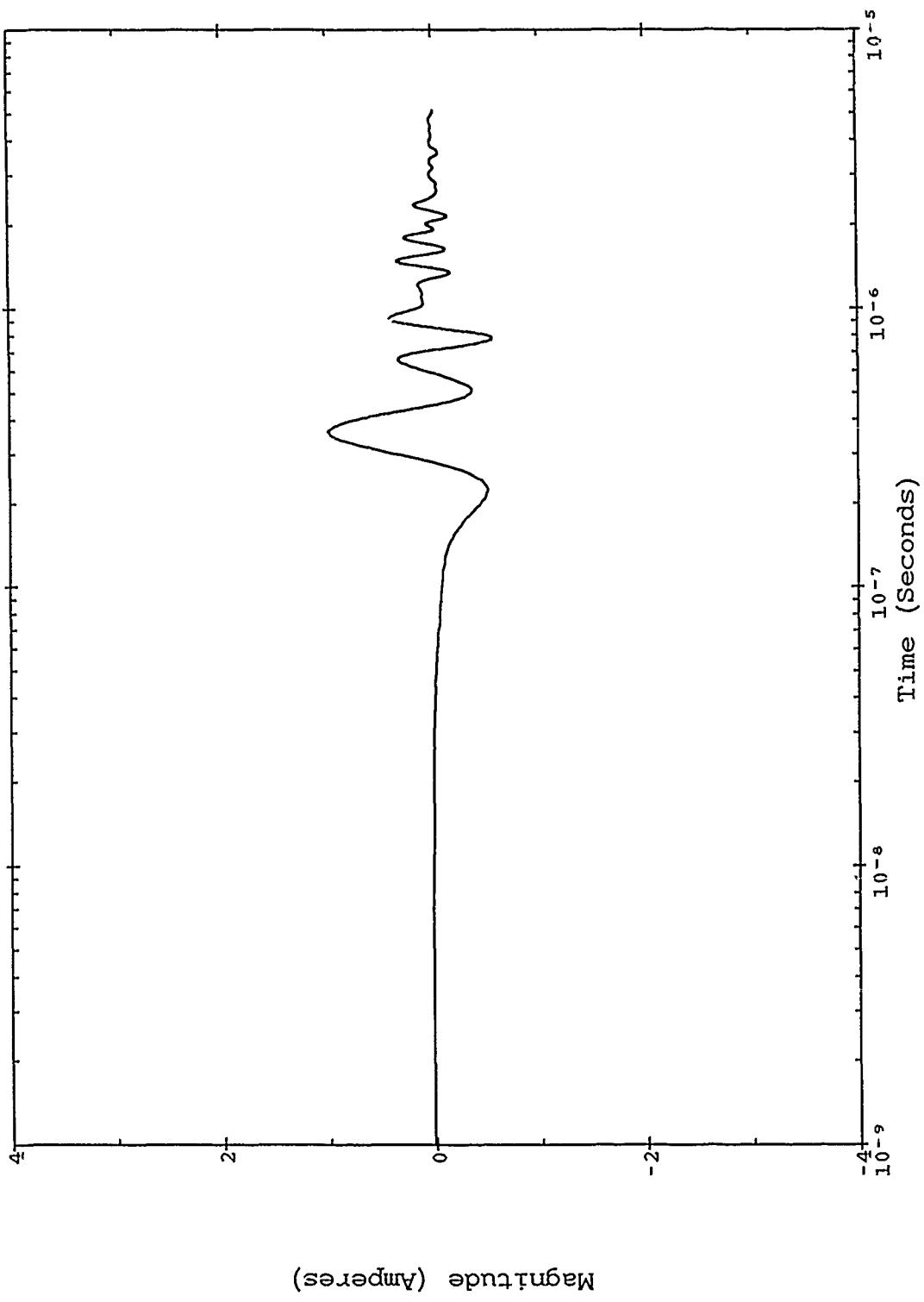


Figure B-352. Severe nearby lightning threat; TP 7045 SN 2260.

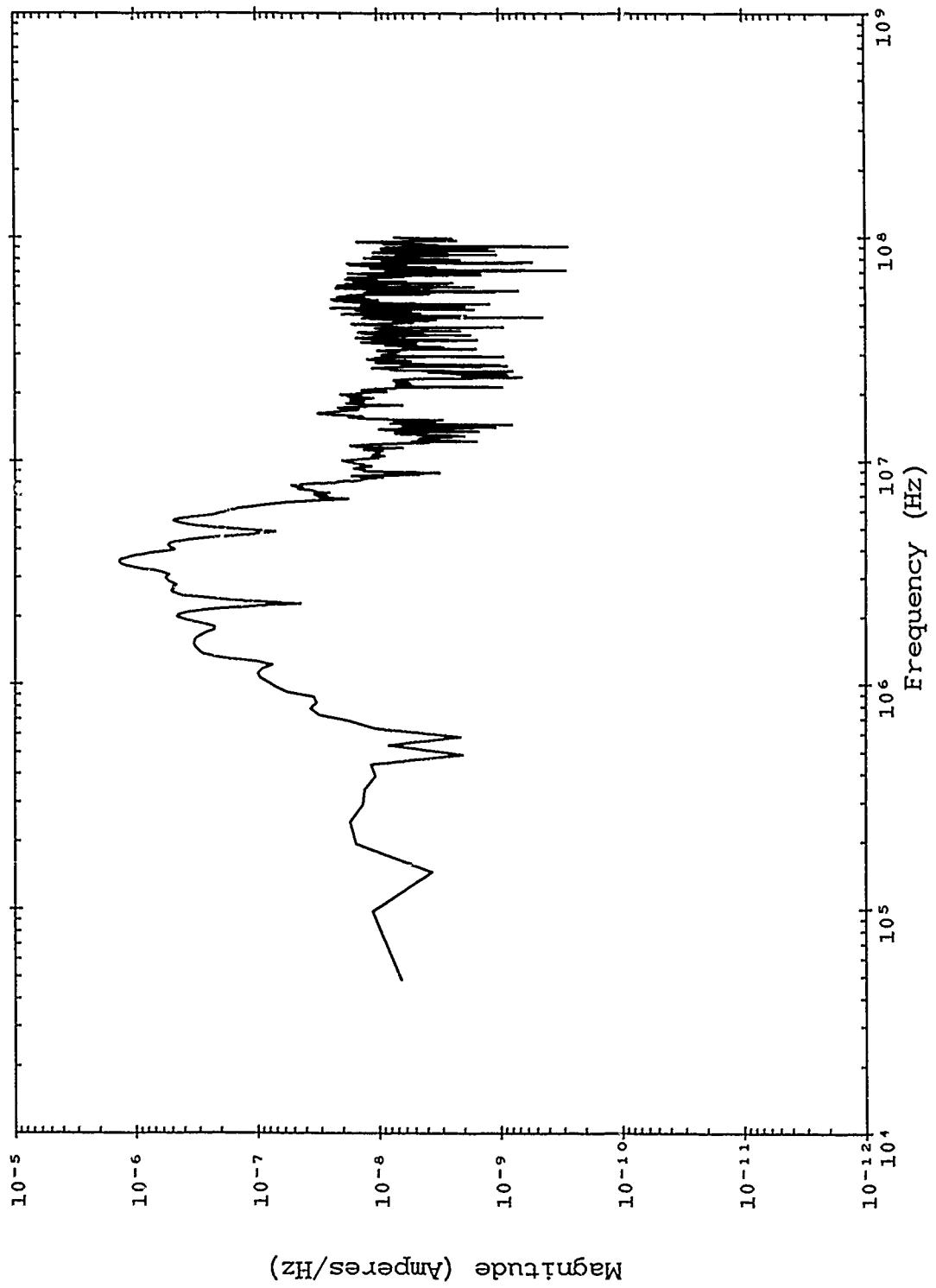


Figure B-353. Double exponential threat; TP 7045 SN 2260.

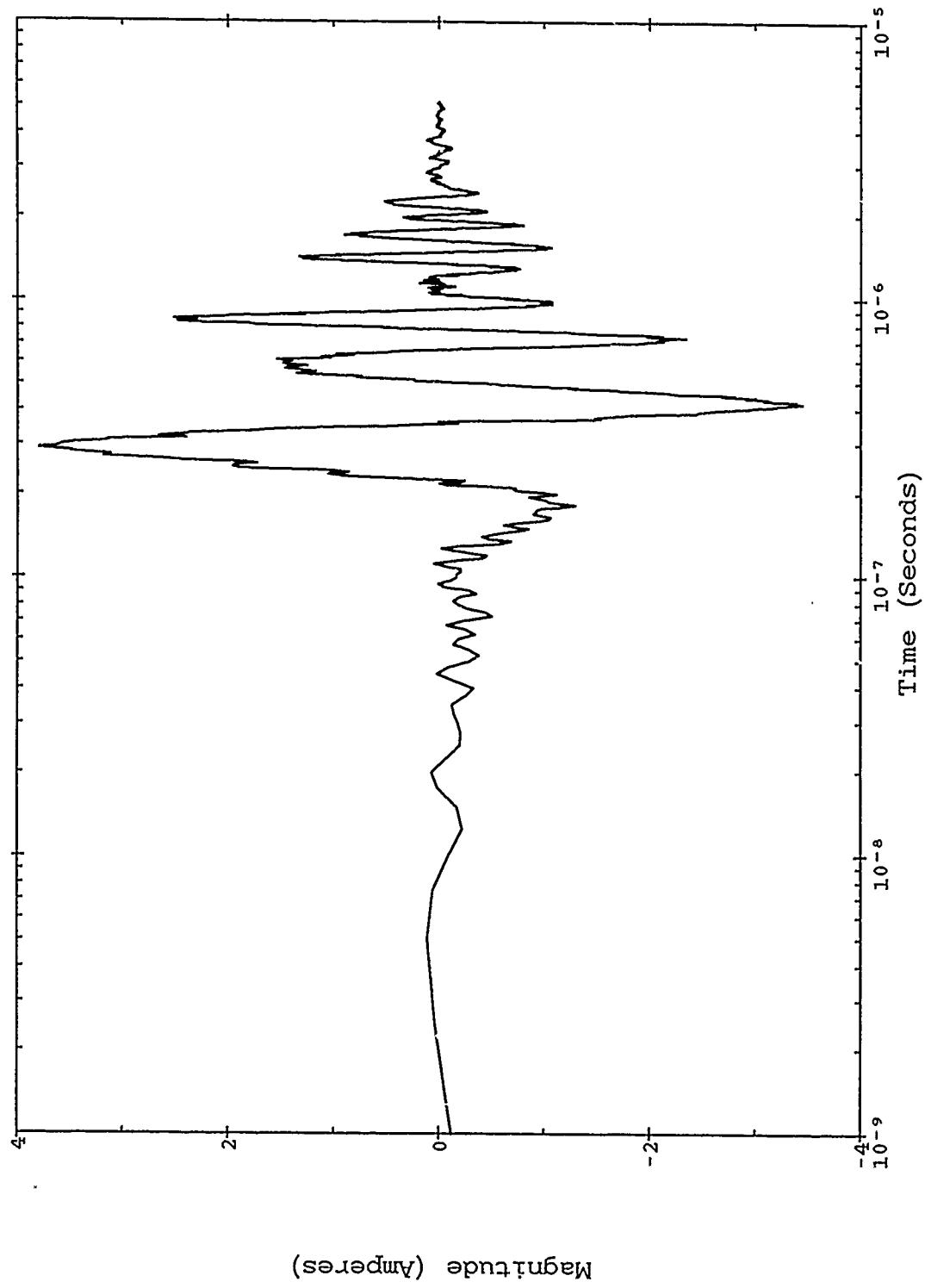


Figure B-354. Double exponential threat; TP 7045 SN 2260.

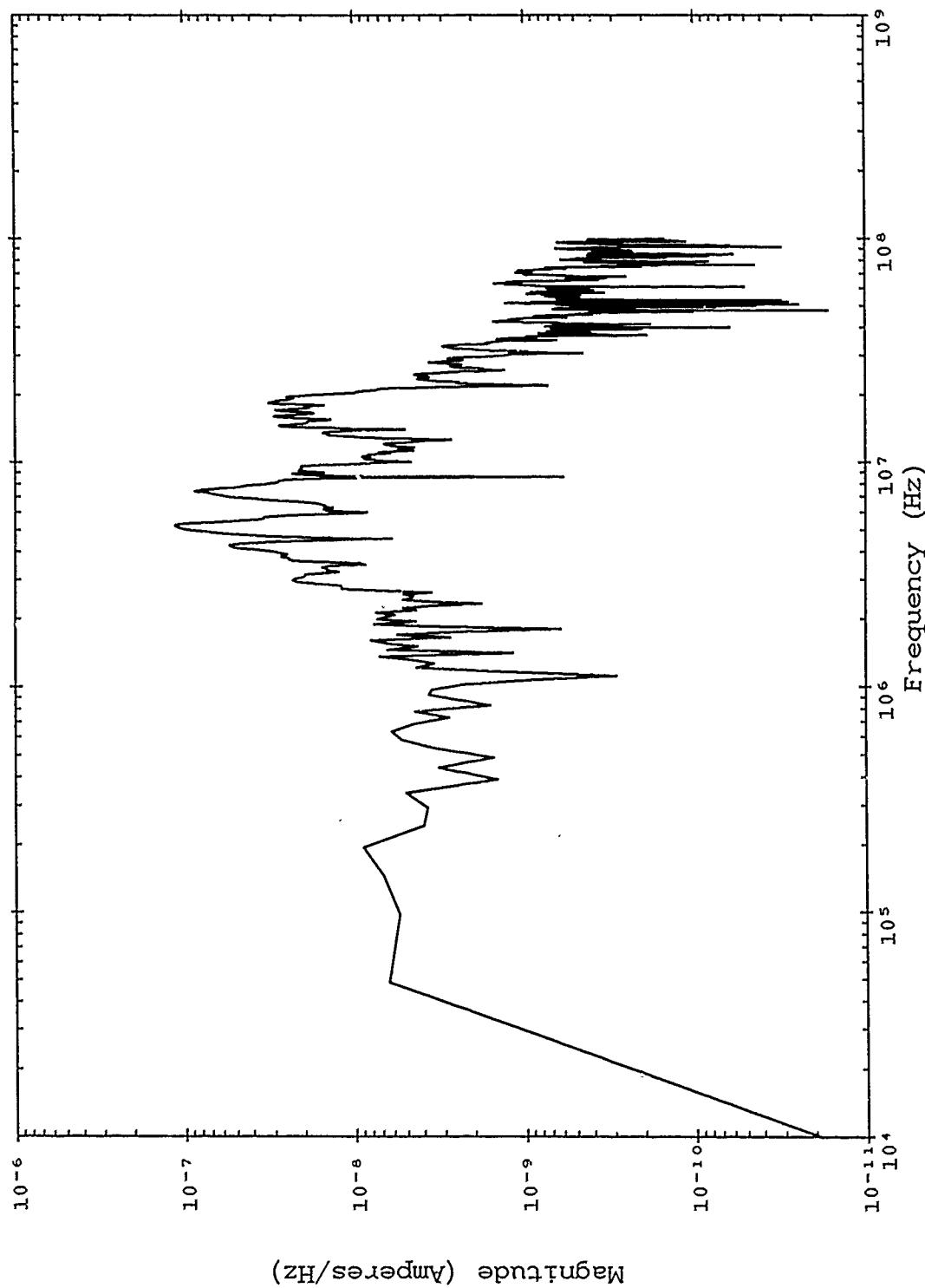


Figure B-355. Corrected TRESTLE data; TP 7059 SN 2226.

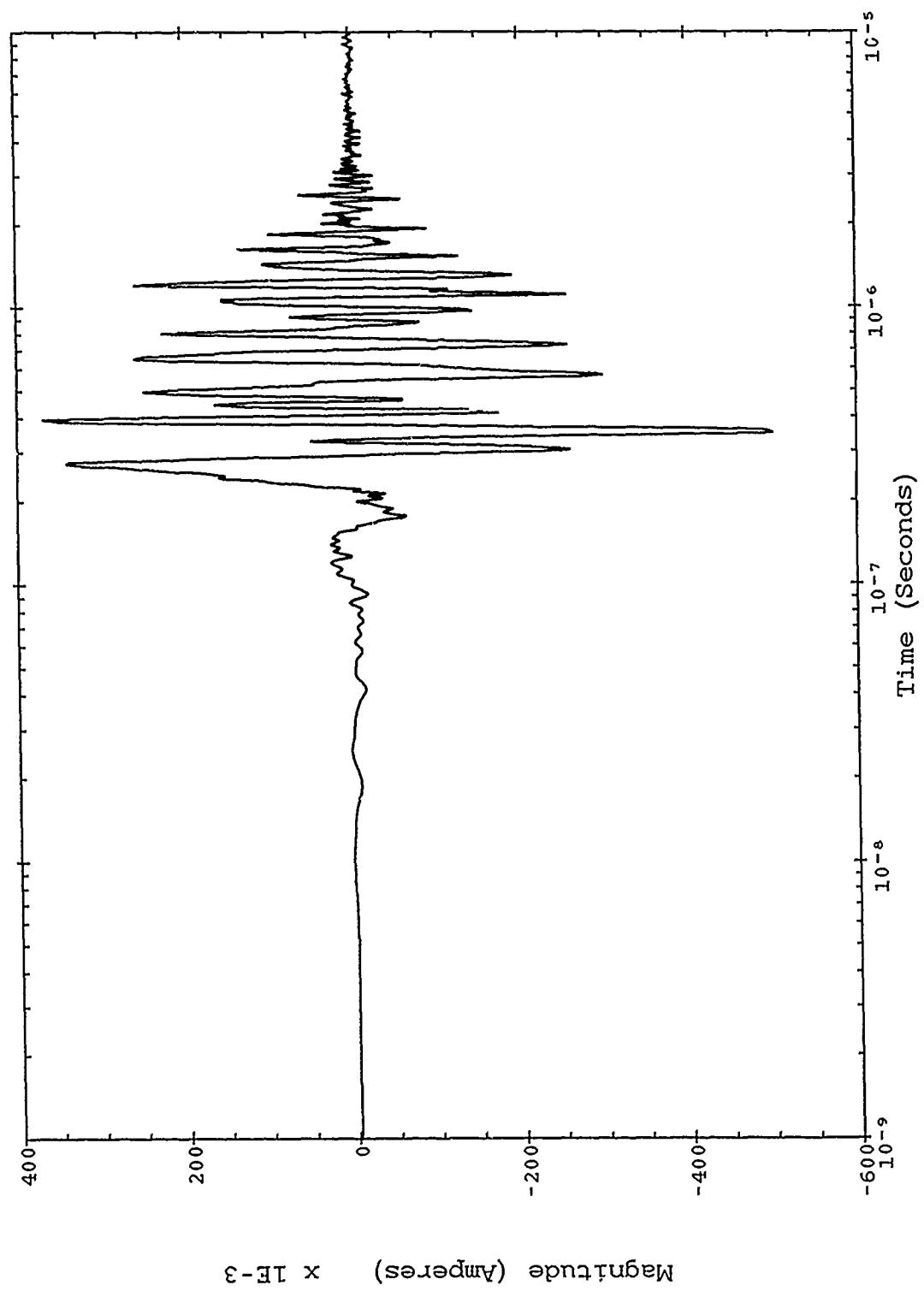


Figure B-356. Corrected TRESTLE data: TP 7059 SN 2226.

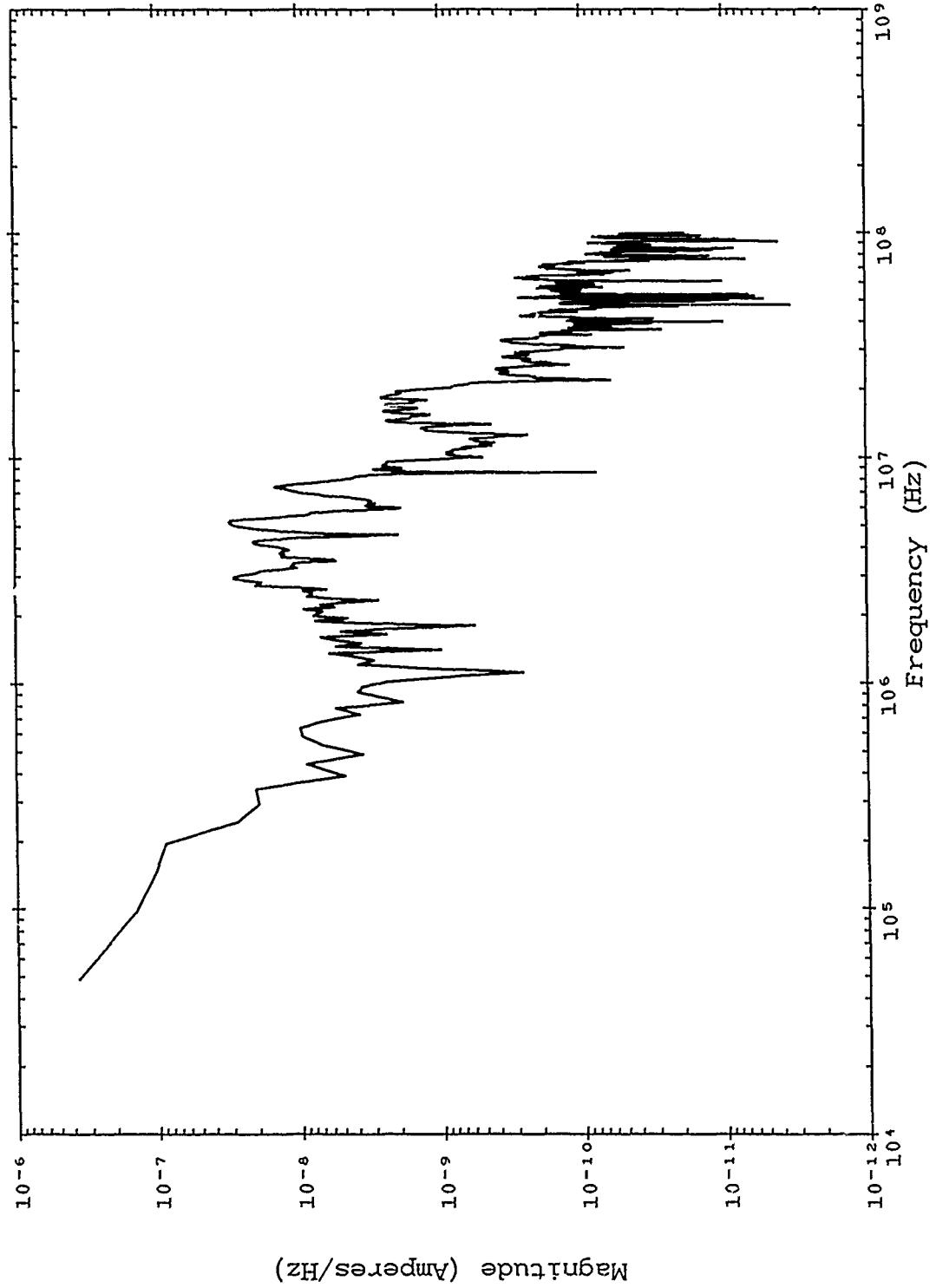


Figure B-357. Severe nearby lightning threat; TP 7059 SN 2226.

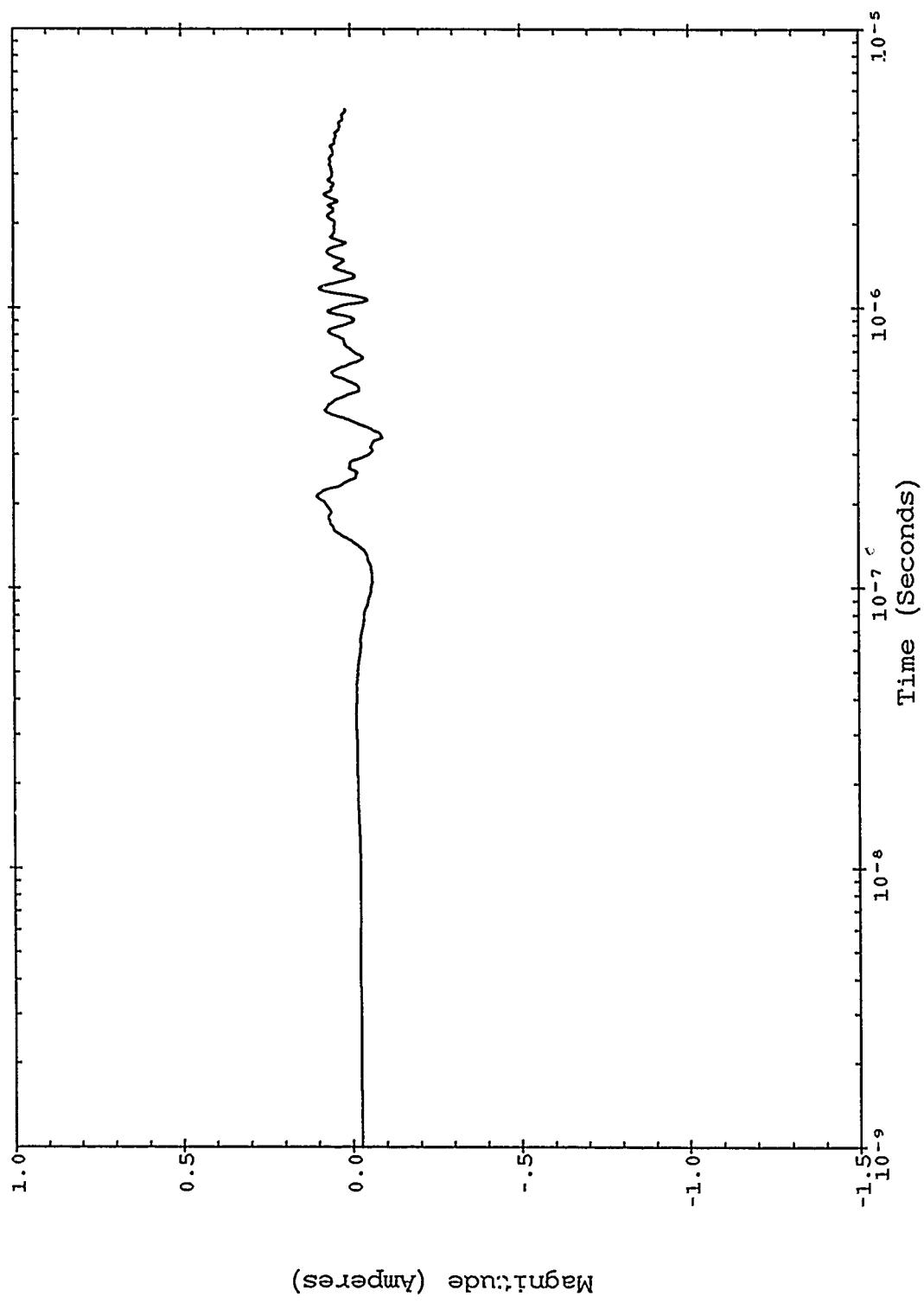


Figure B-358. Severe nearby lightning threat; TP 7059 SN 2226.

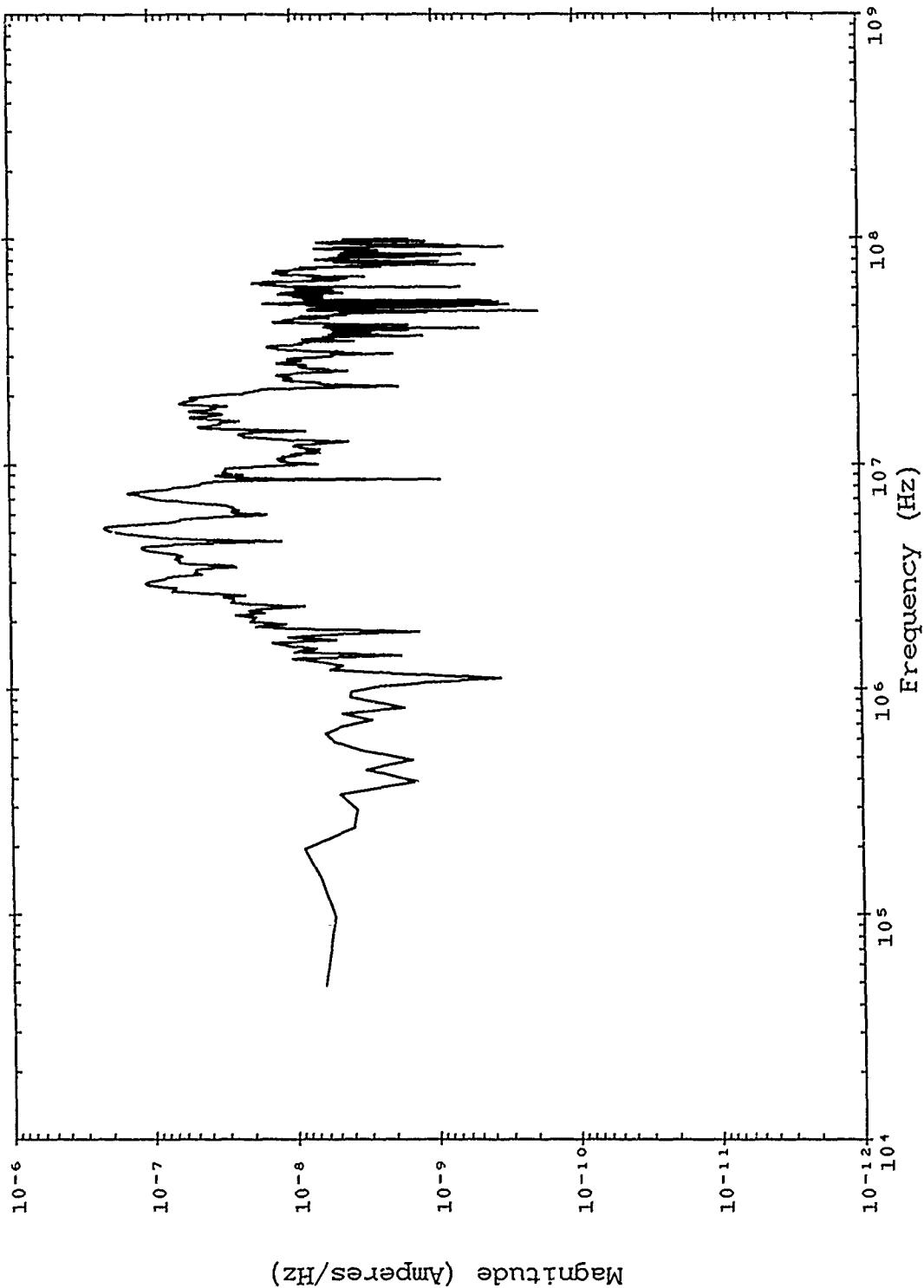


Figure B-359. Double exponential threat; TP 7059 SN 2226.

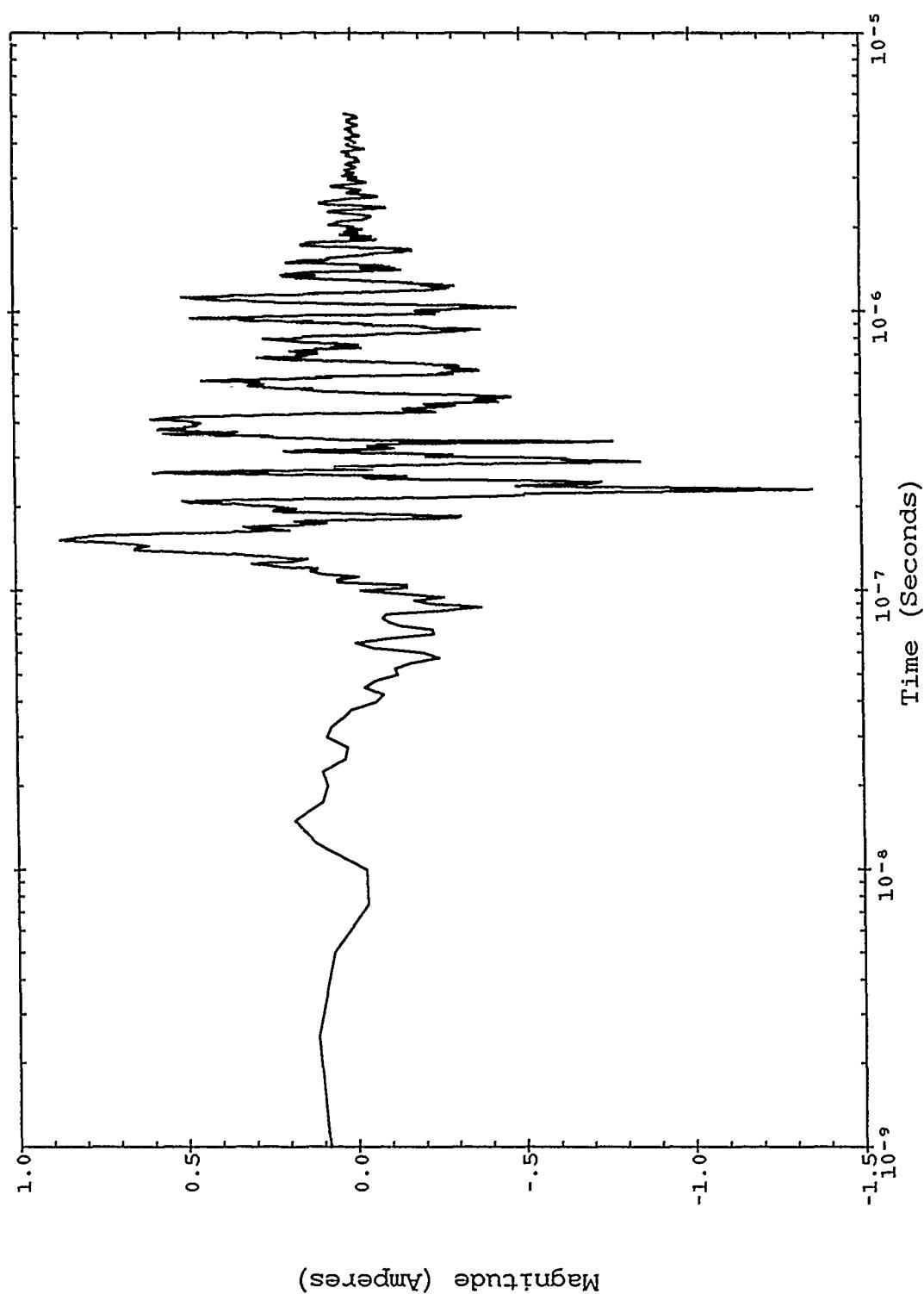


Figure B-360. Double exponential threat; TP 7059 SN 2226.

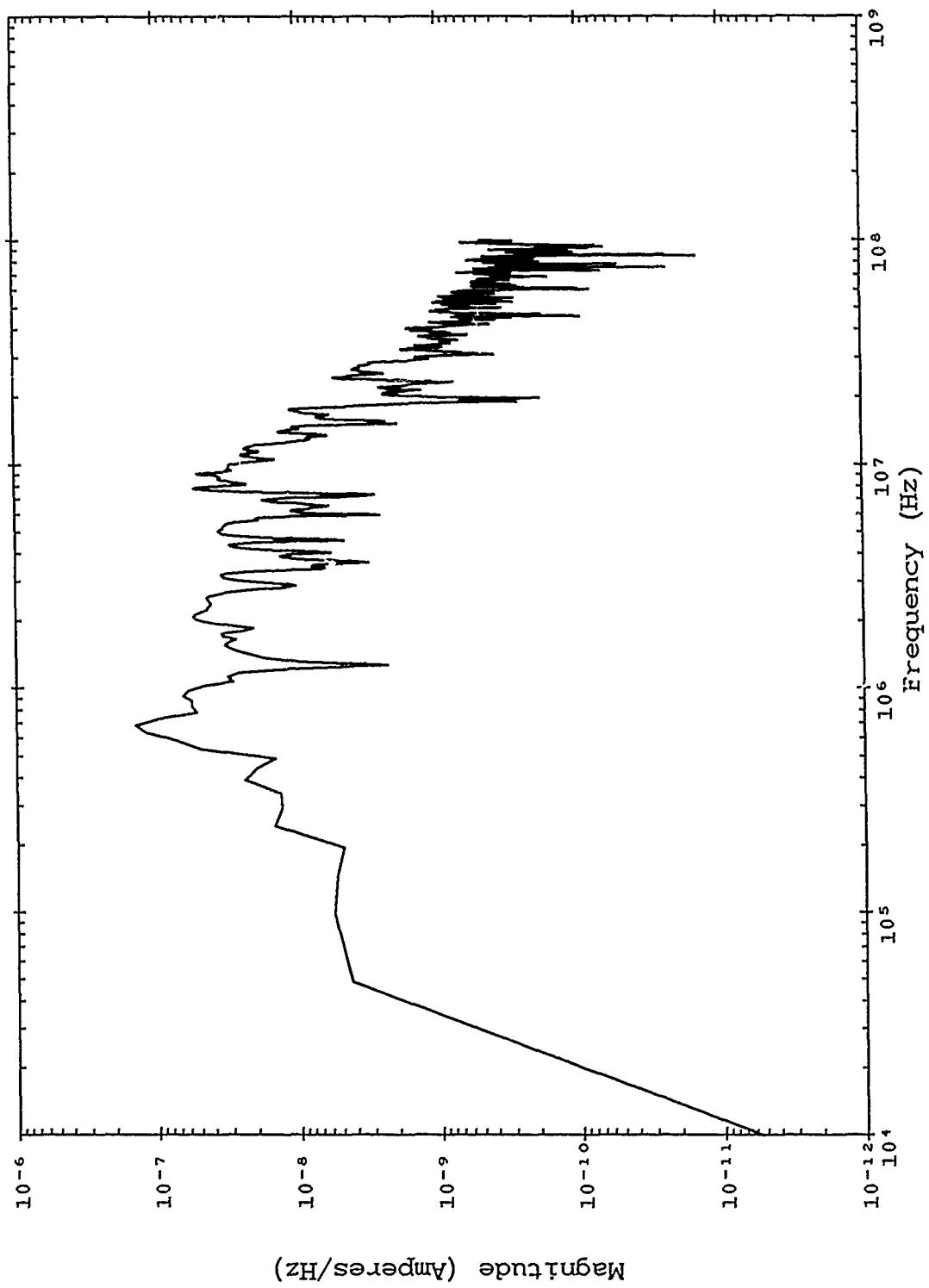


Figure B-361. Corrected TRESTLE data; TP 7171 SN 2504.

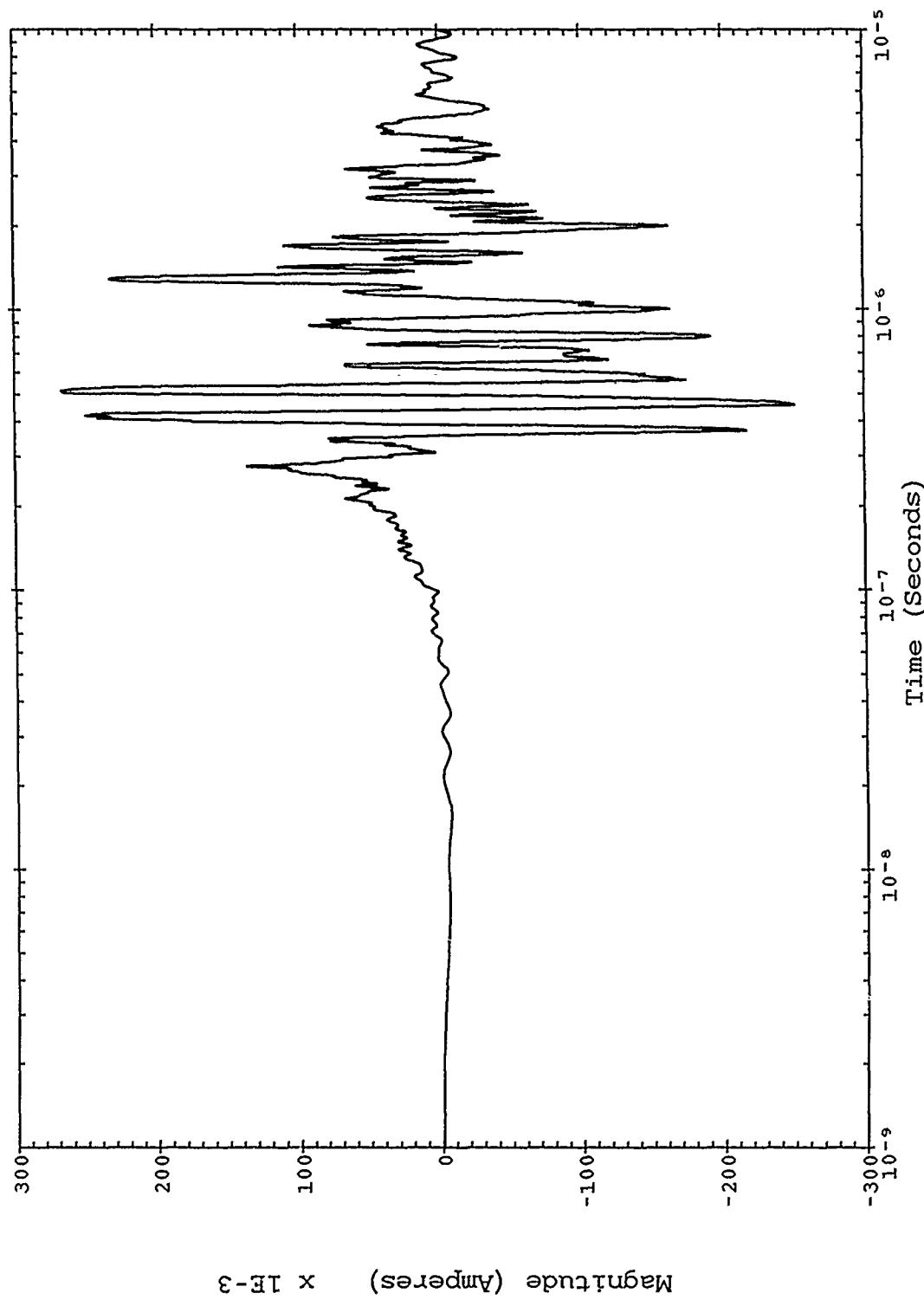


Figure B-362. Corrected TRESTLE data; TP 7171 SN 2504.

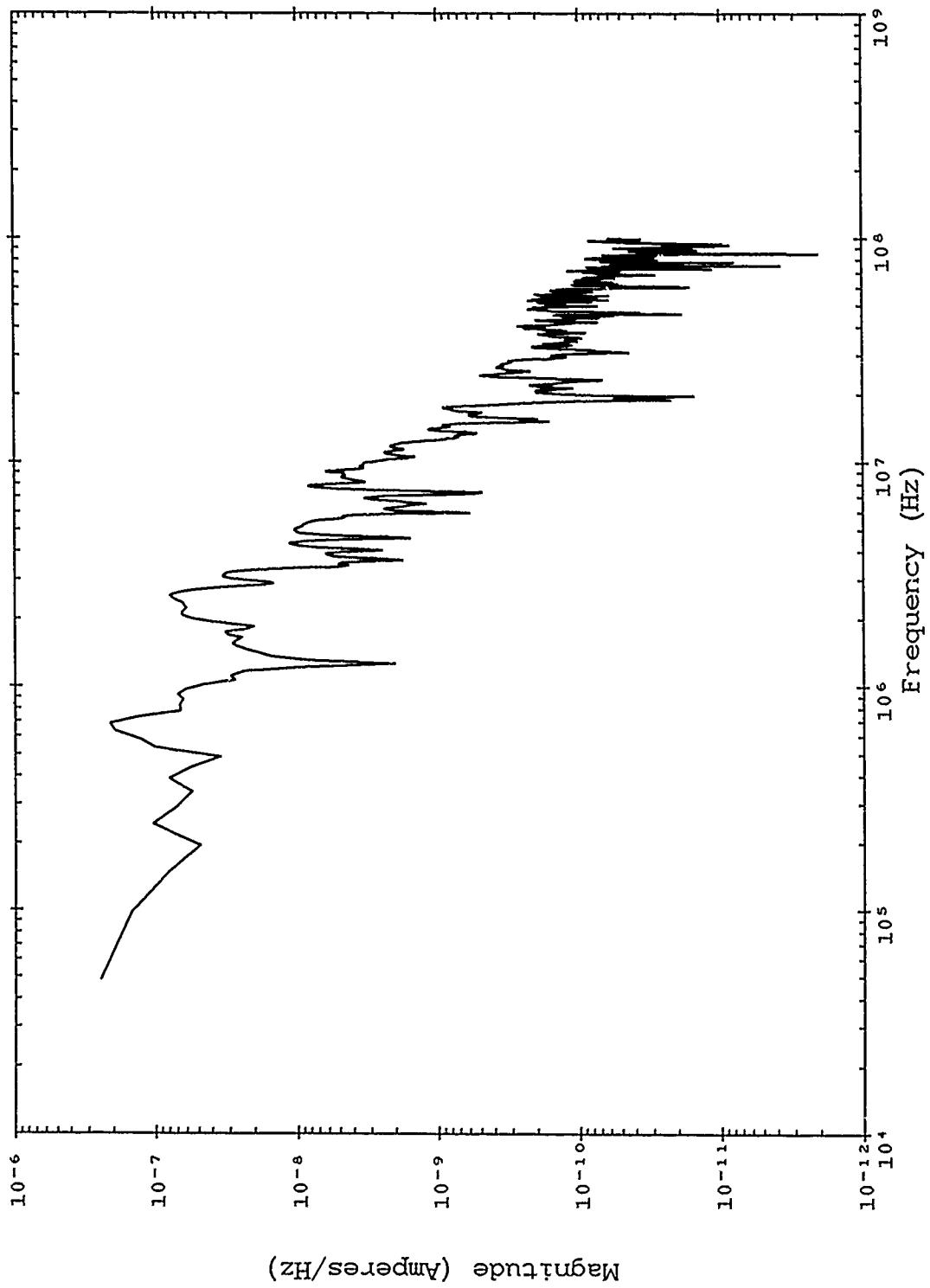


Figure B-363. Severe nearby lightning threat; TP 7171 SN 2504.

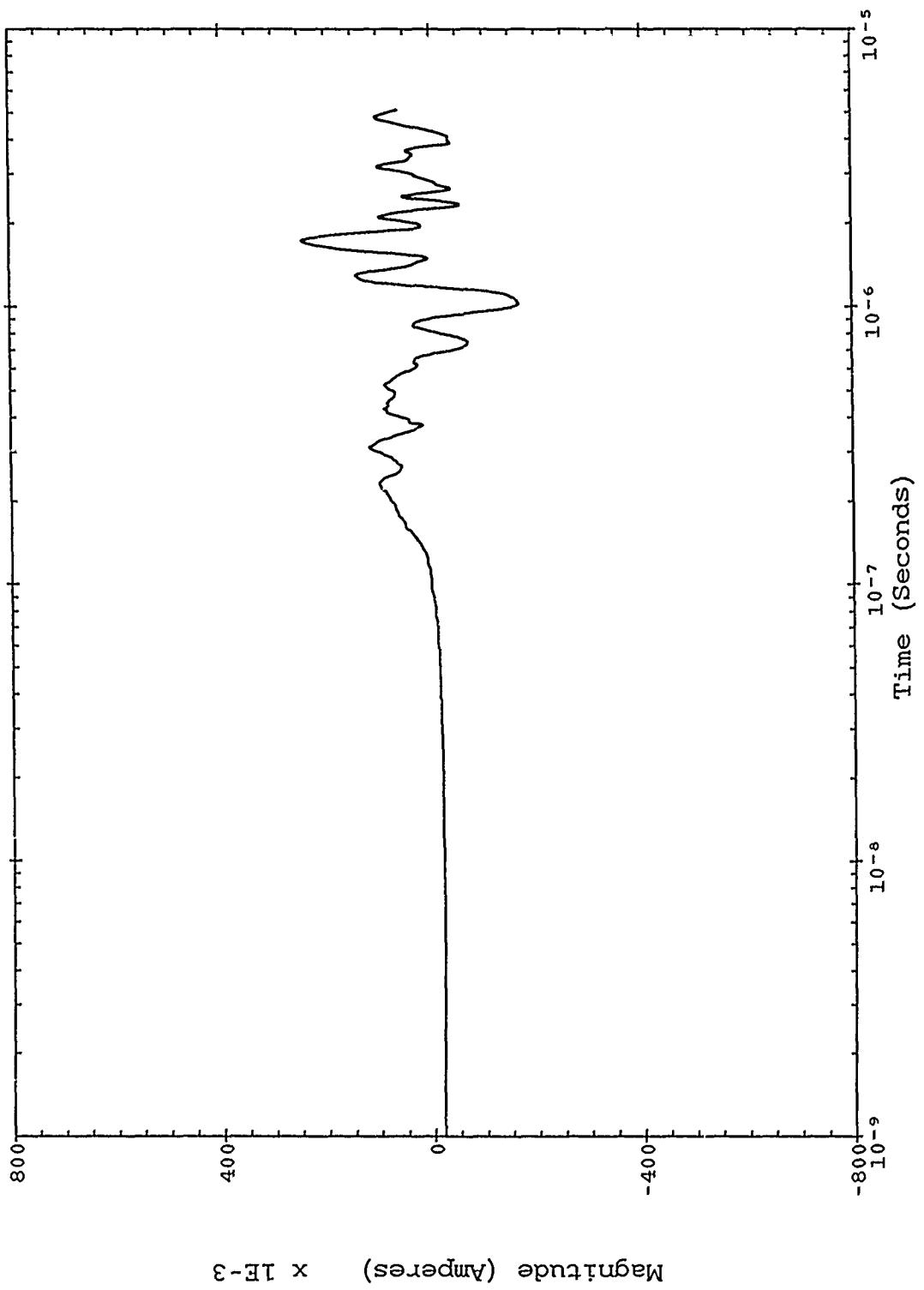


Figure B-364. Severe nearby lightning threat; TP 7171 SN 2504.

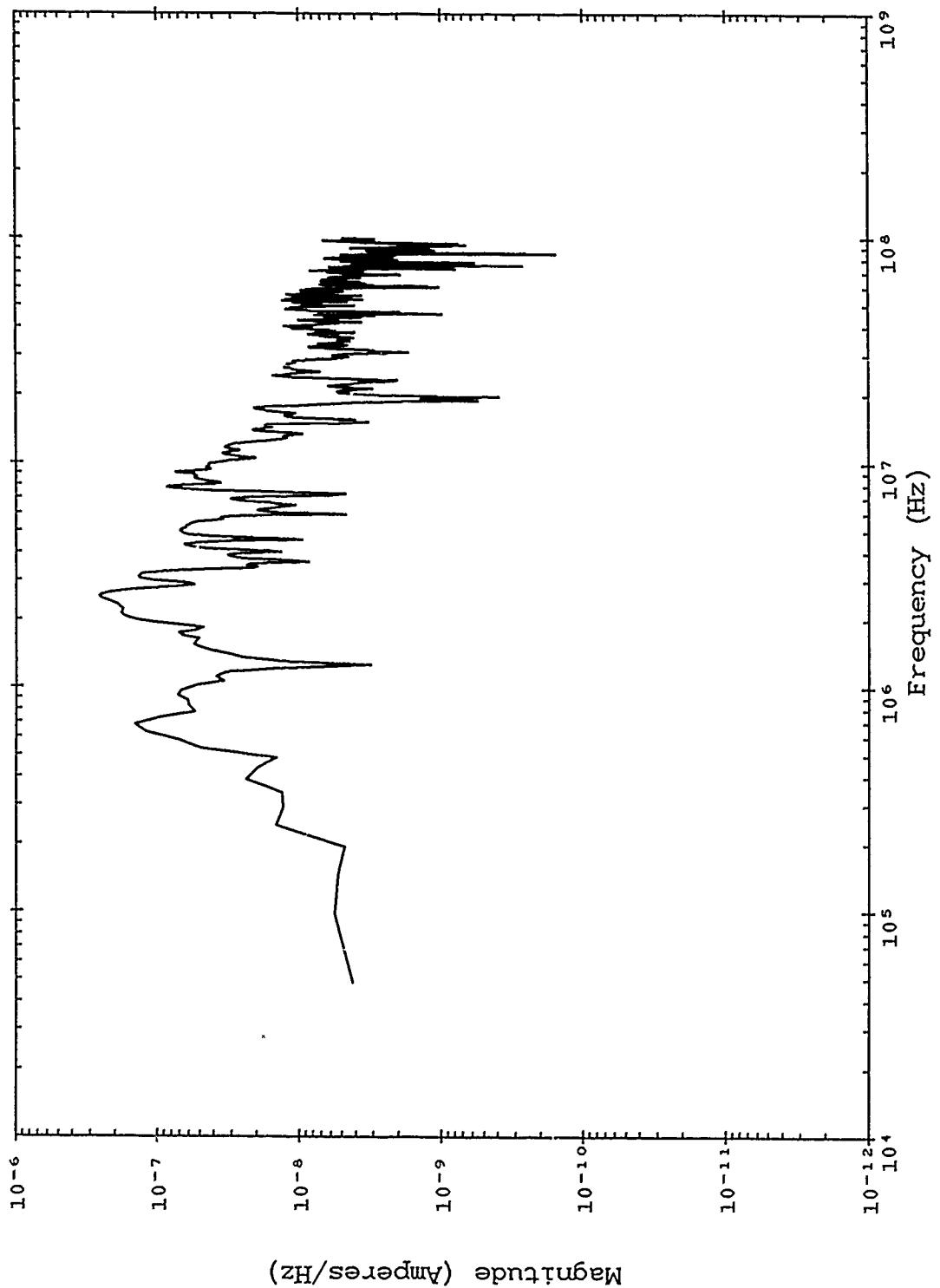


Figure B-365. Double exponential threat; TP 7171 SN 2504.

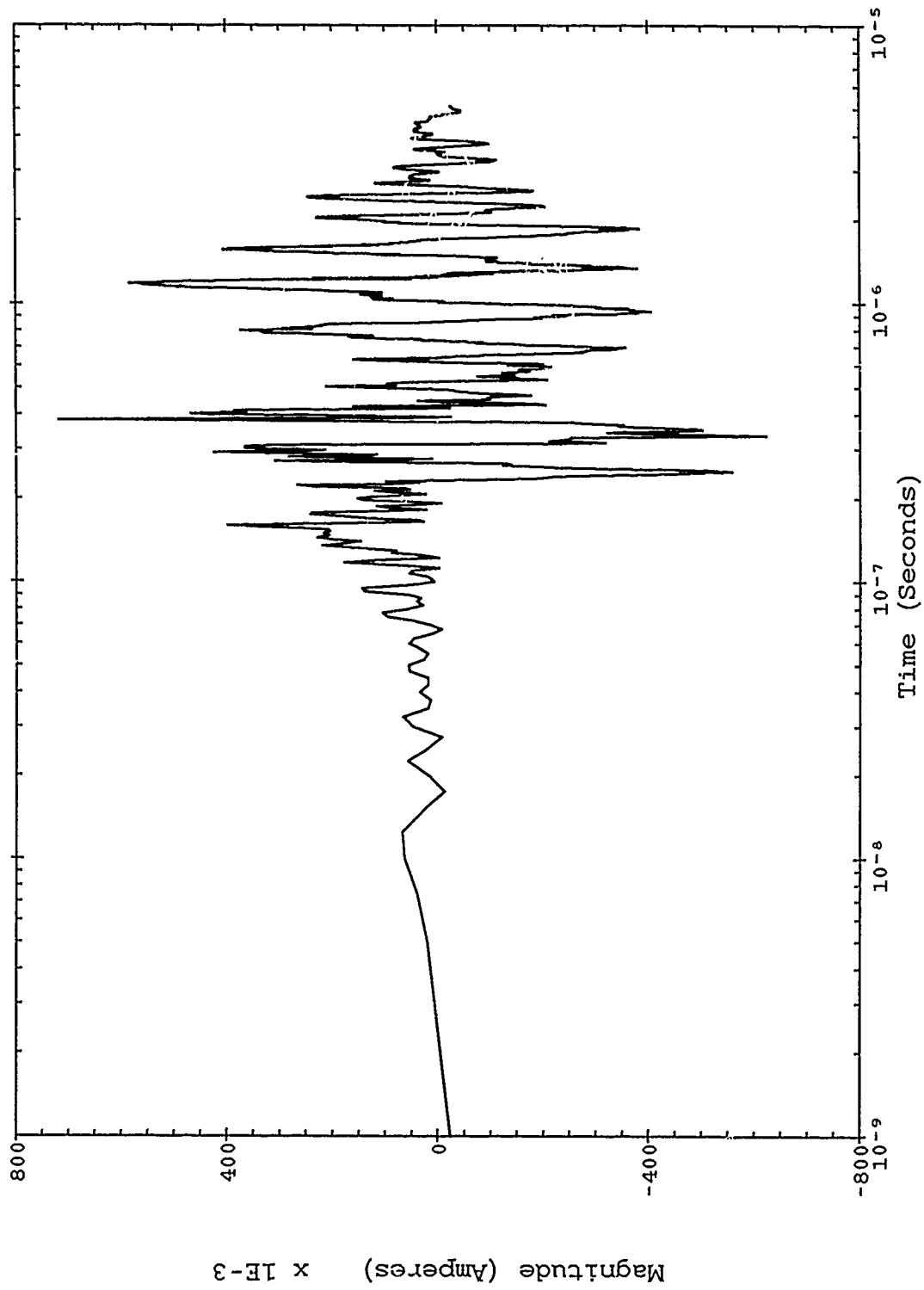


Figure B-366. Double exponential threat; TP 7171 SN 2504.

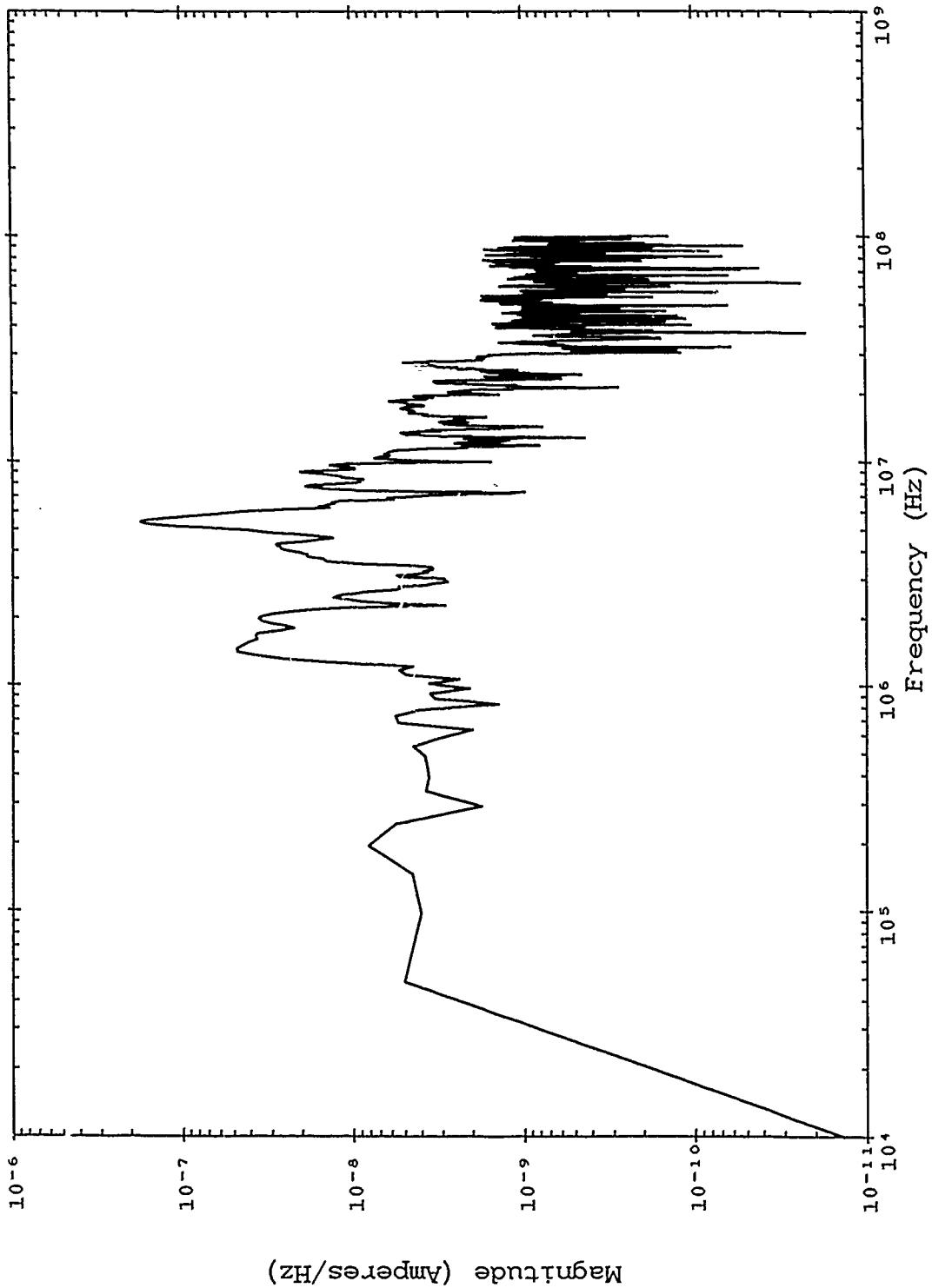


Figure B-367. Corrected TRESTLE data; TP 7187 SN 2266.

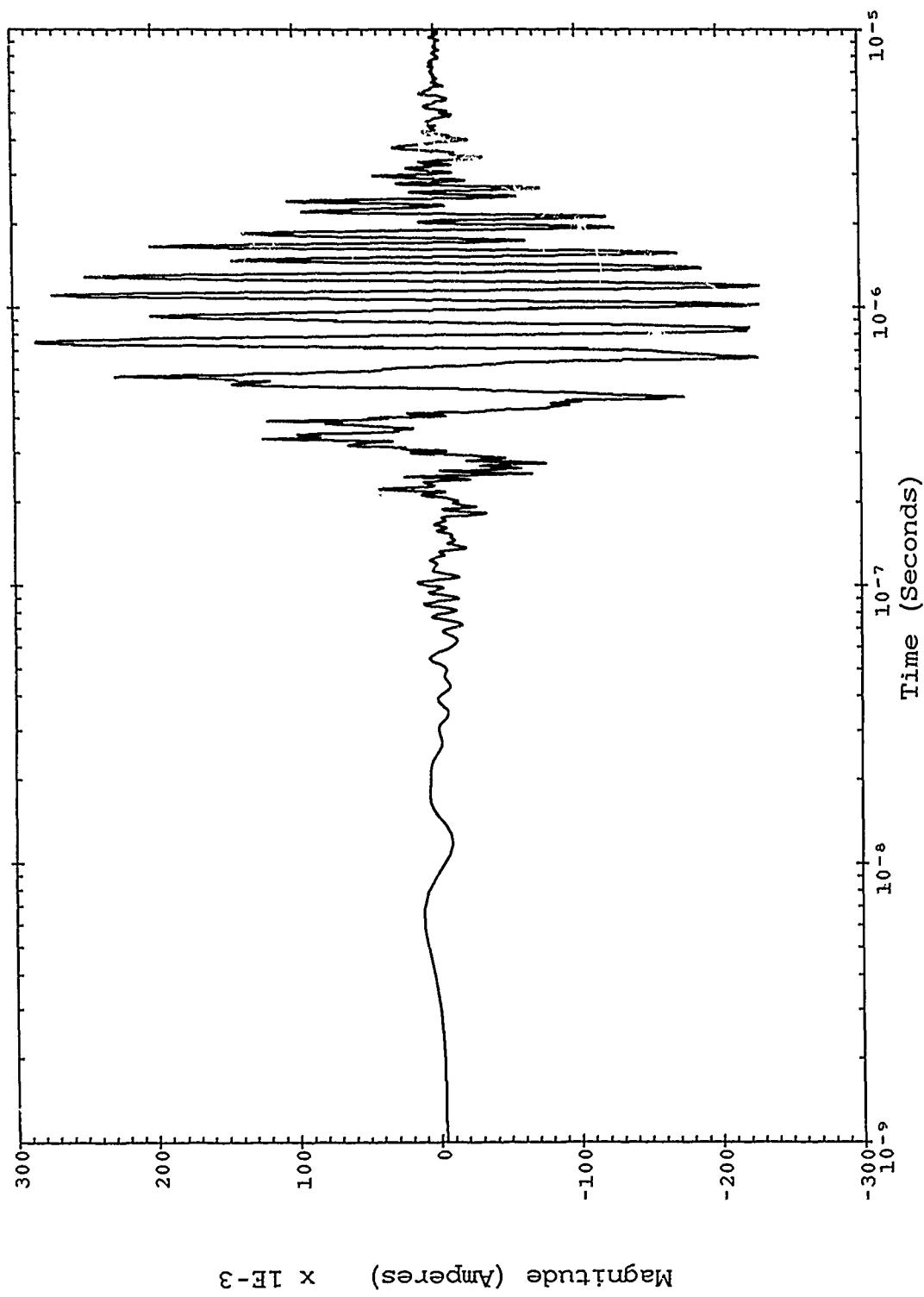


Figure B-368. Corrected TRESTLE data: TP 7187 SN 2266.

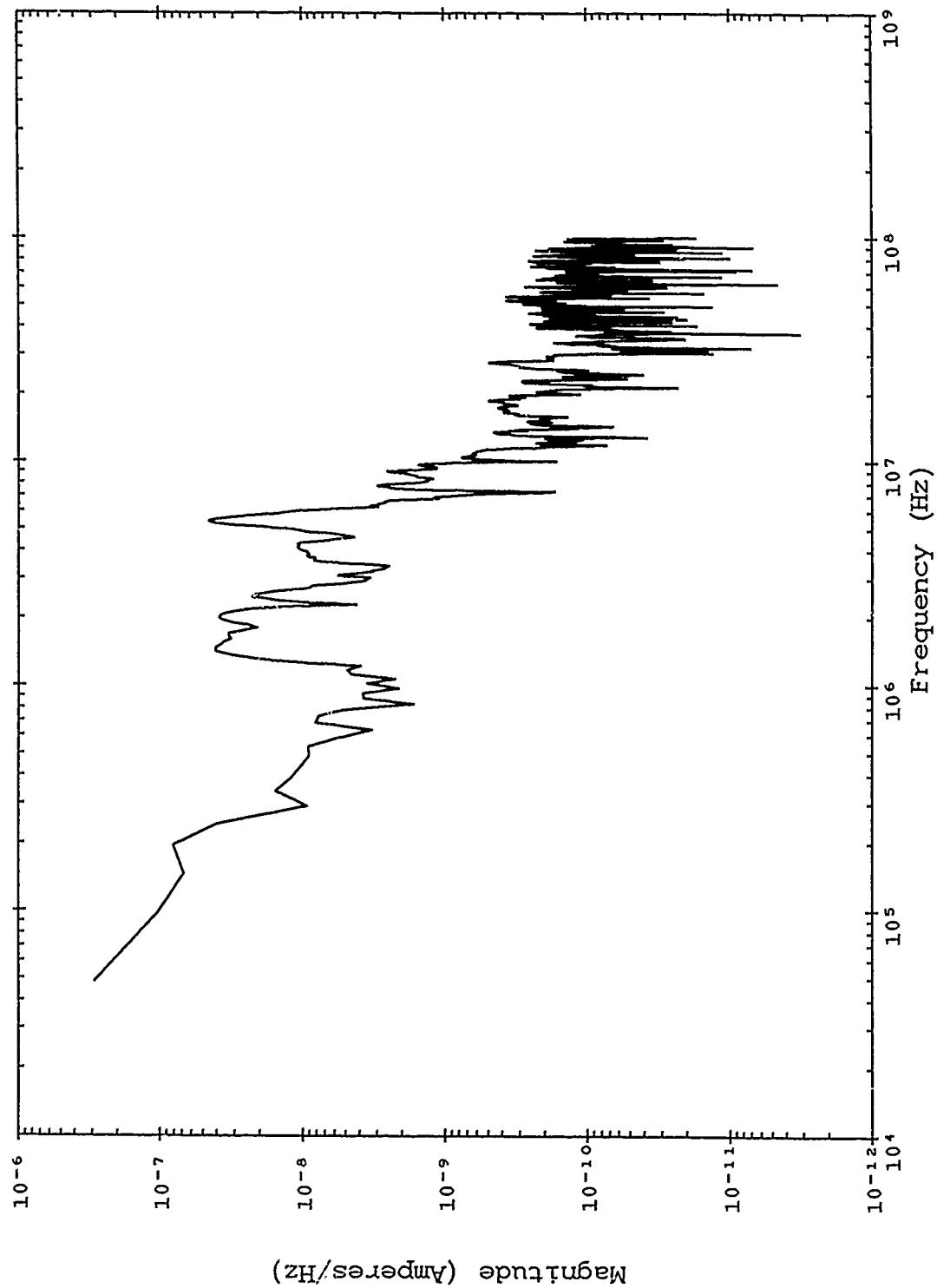


Figure B-369. Severe nearby lightning threat; TP 7187 SN 2266.

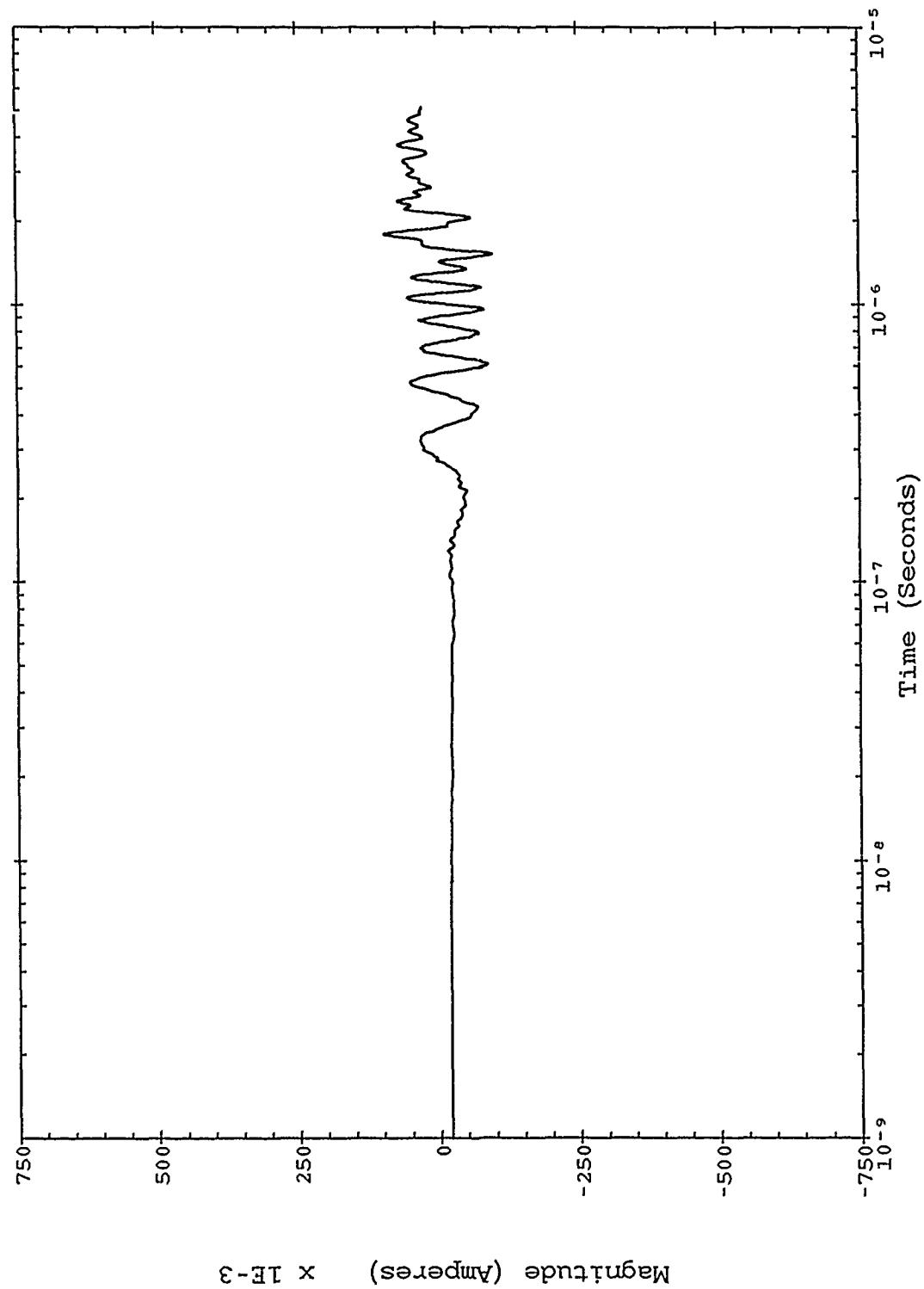


Figure B-370. Severe nearby lightning threat; TP 7187 SN 2266.

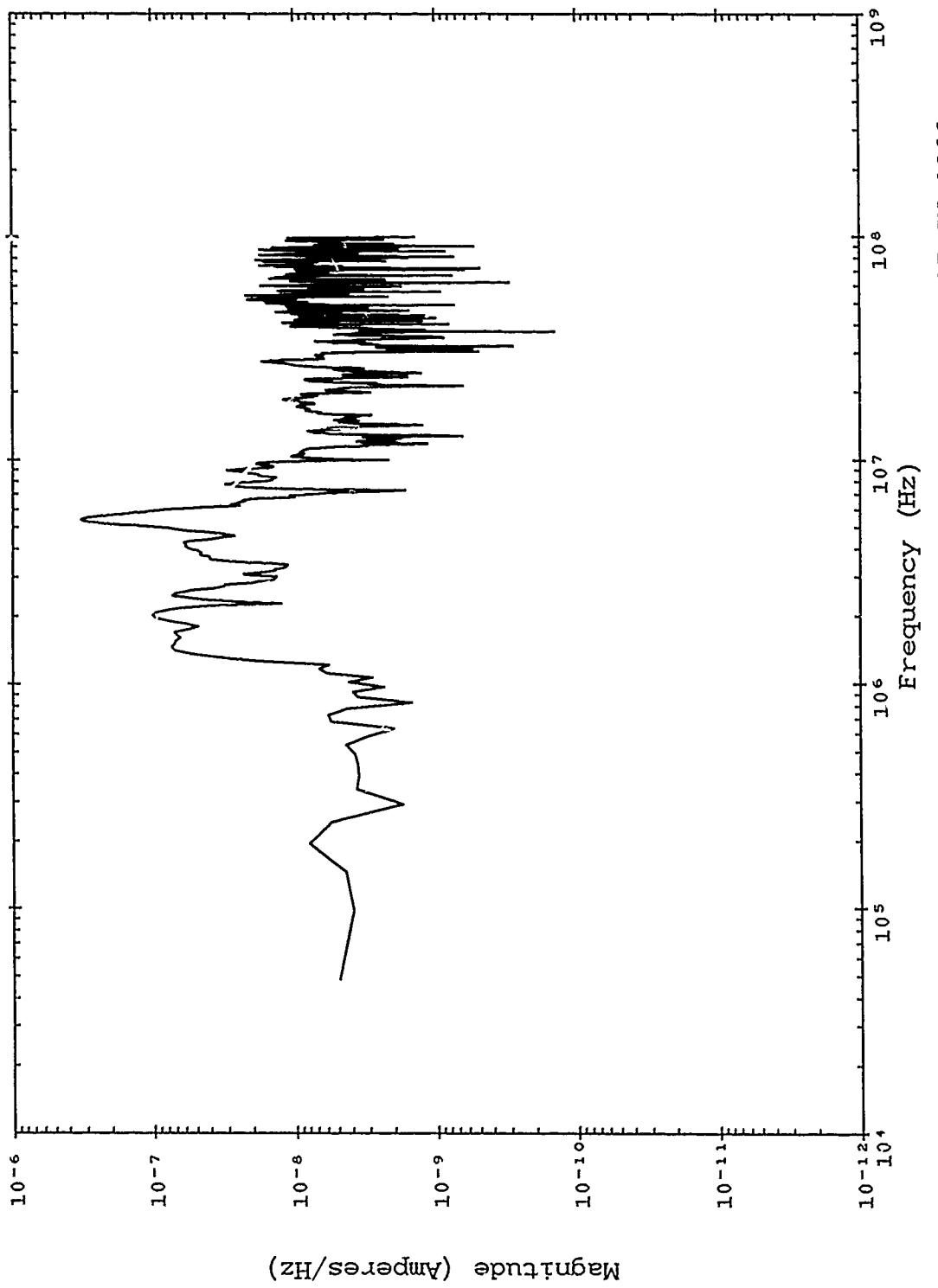


Figure B-371. Double exponential threat; TP 7187 SN 2266.

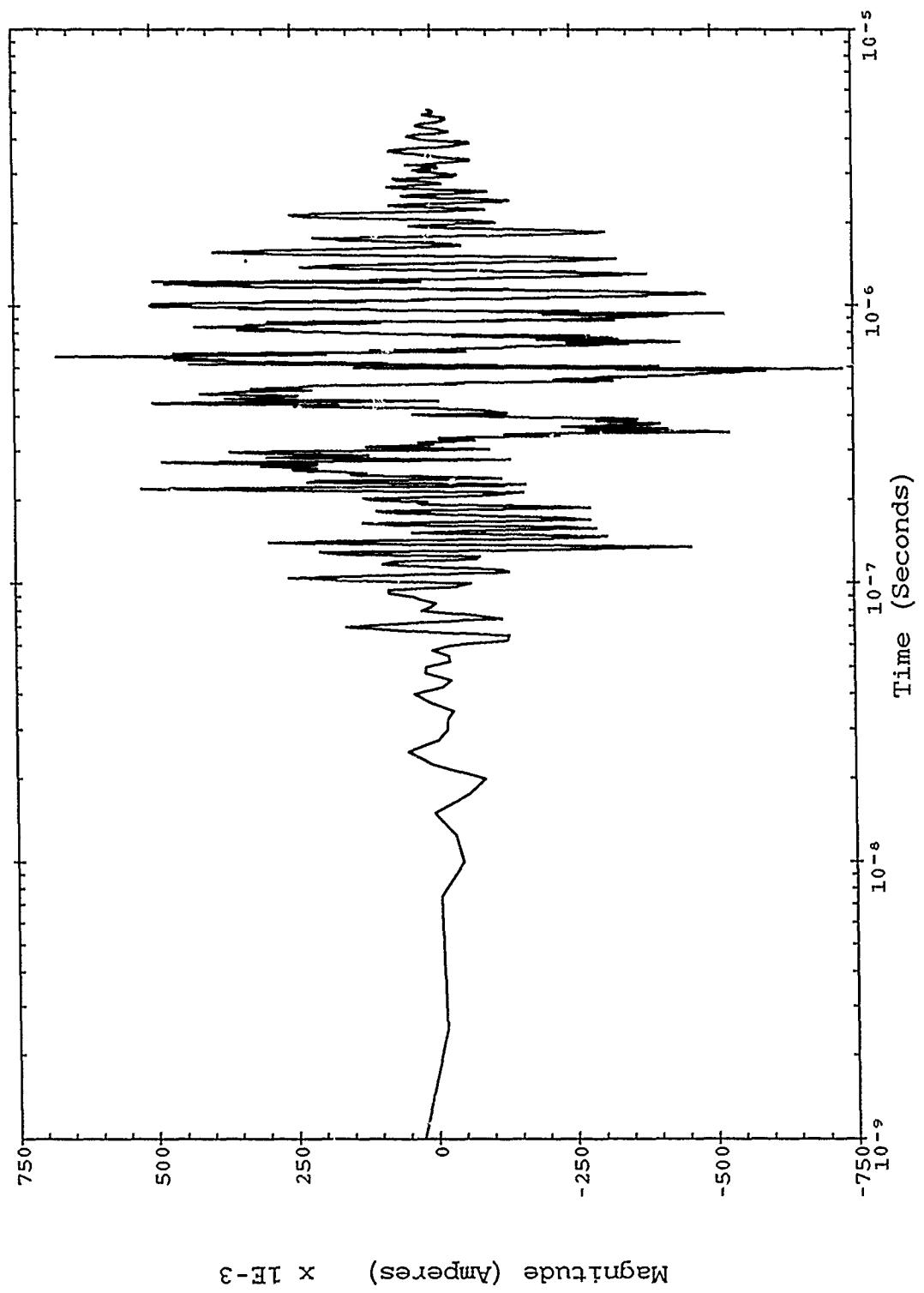


Figure B-372. Double exponential threat; TP 7187 SN 2266.

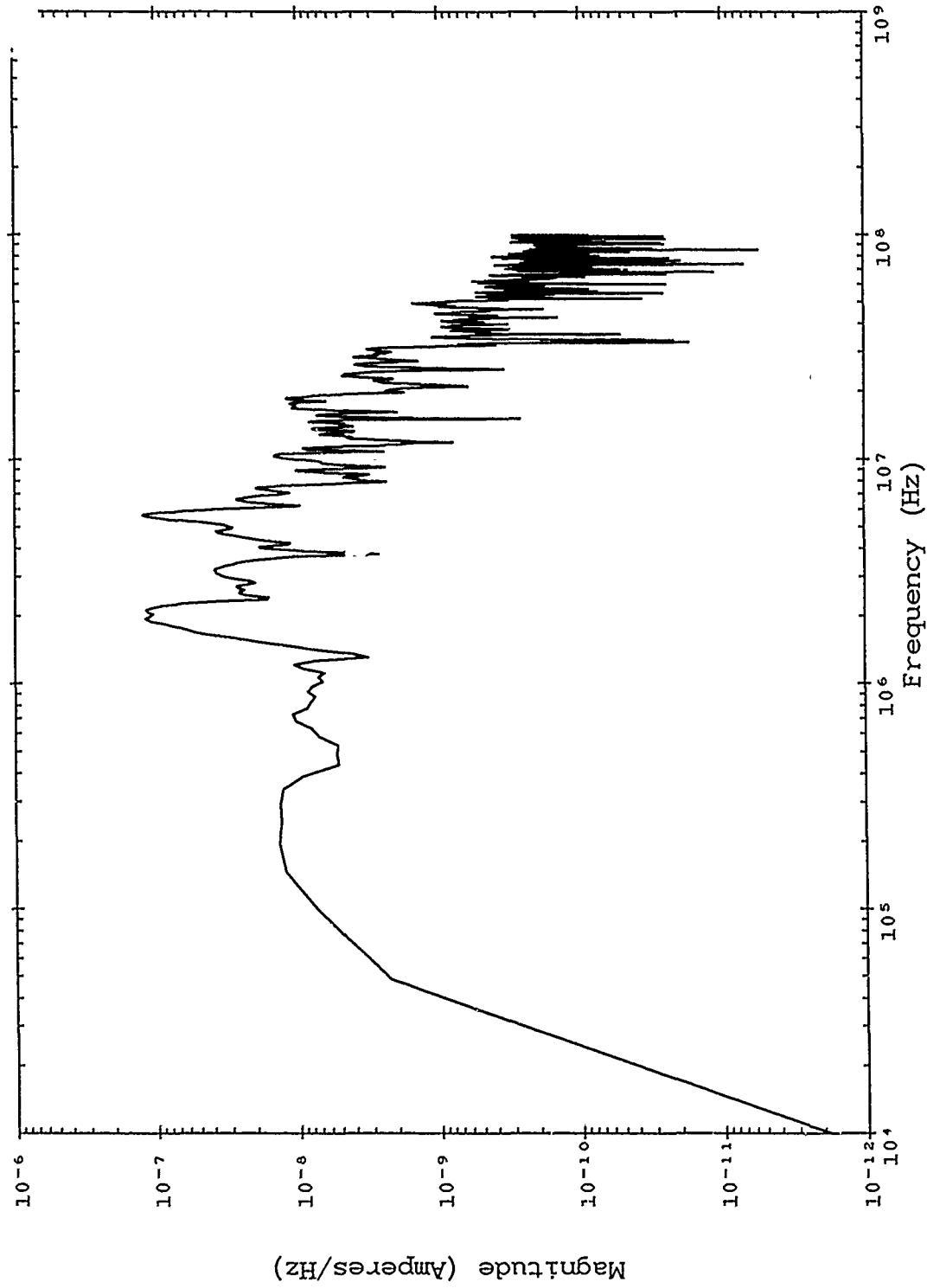


Figure B-373. Corrected TRESTLE data; TP 7407 SN 2166.

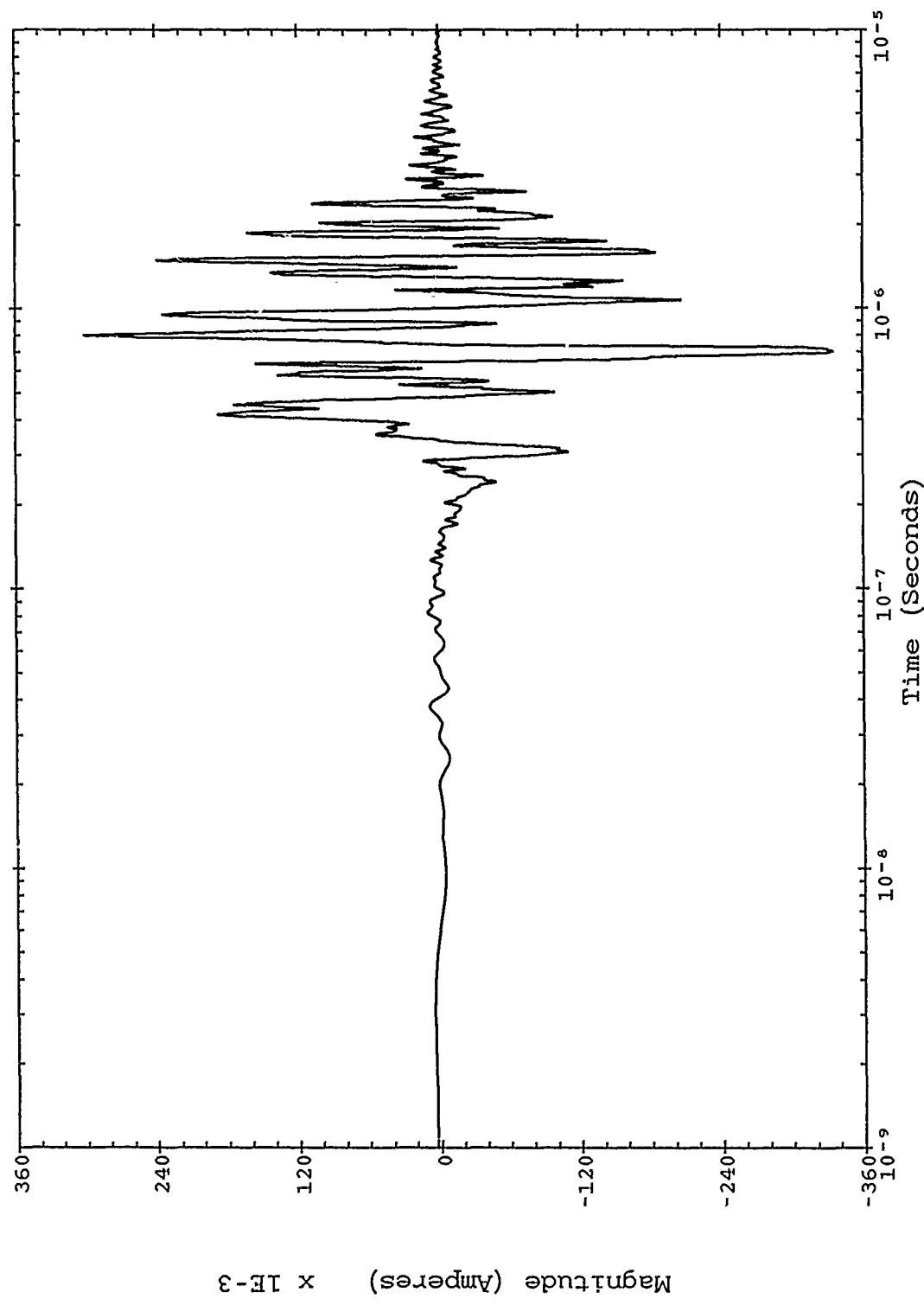


Figure B-374. Corrected TRESTLE data; TP 7407 SN 2166.

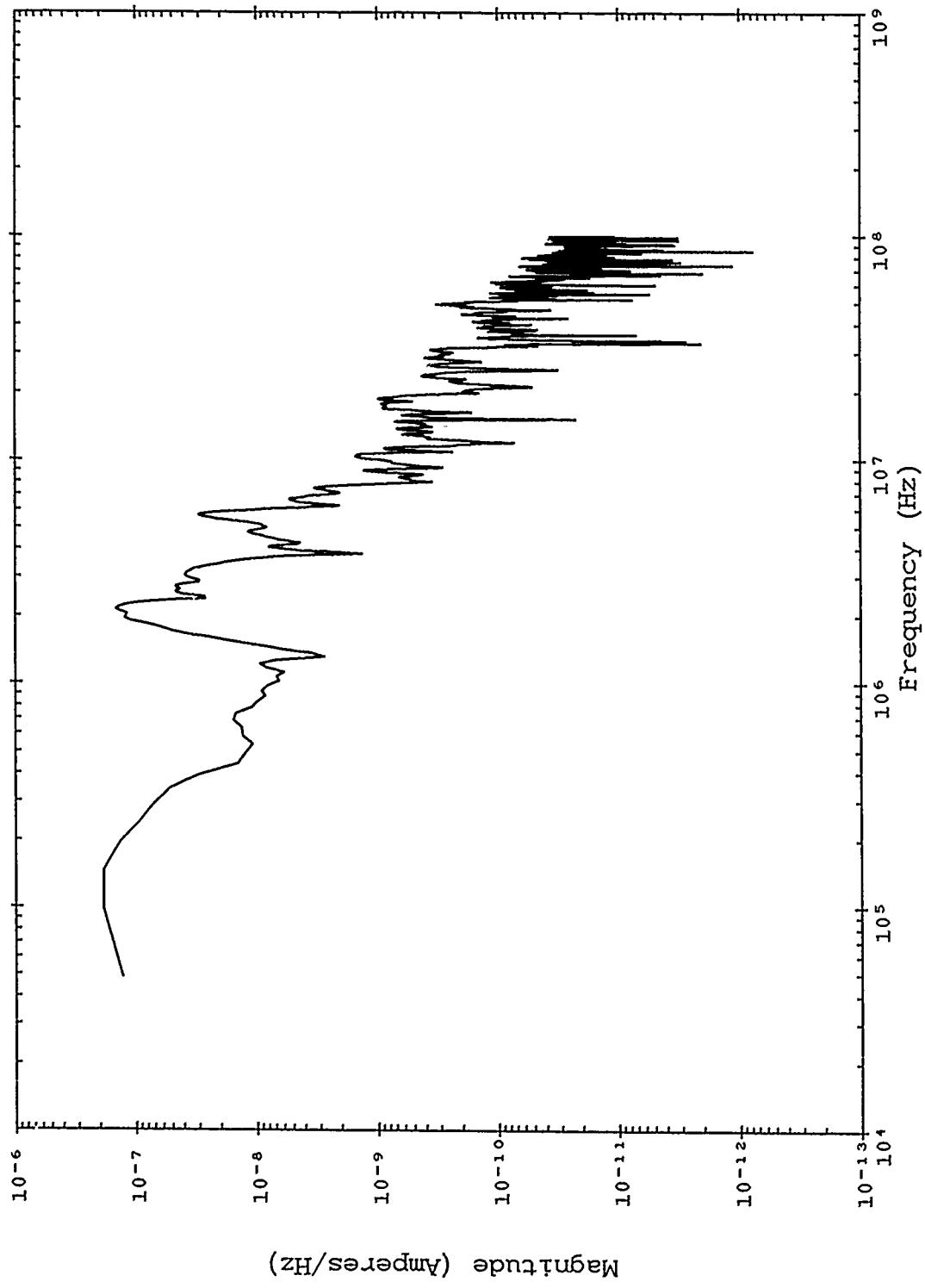


Figure B-375. Severe nearby lightning threat; TP 7407 SN 2166.

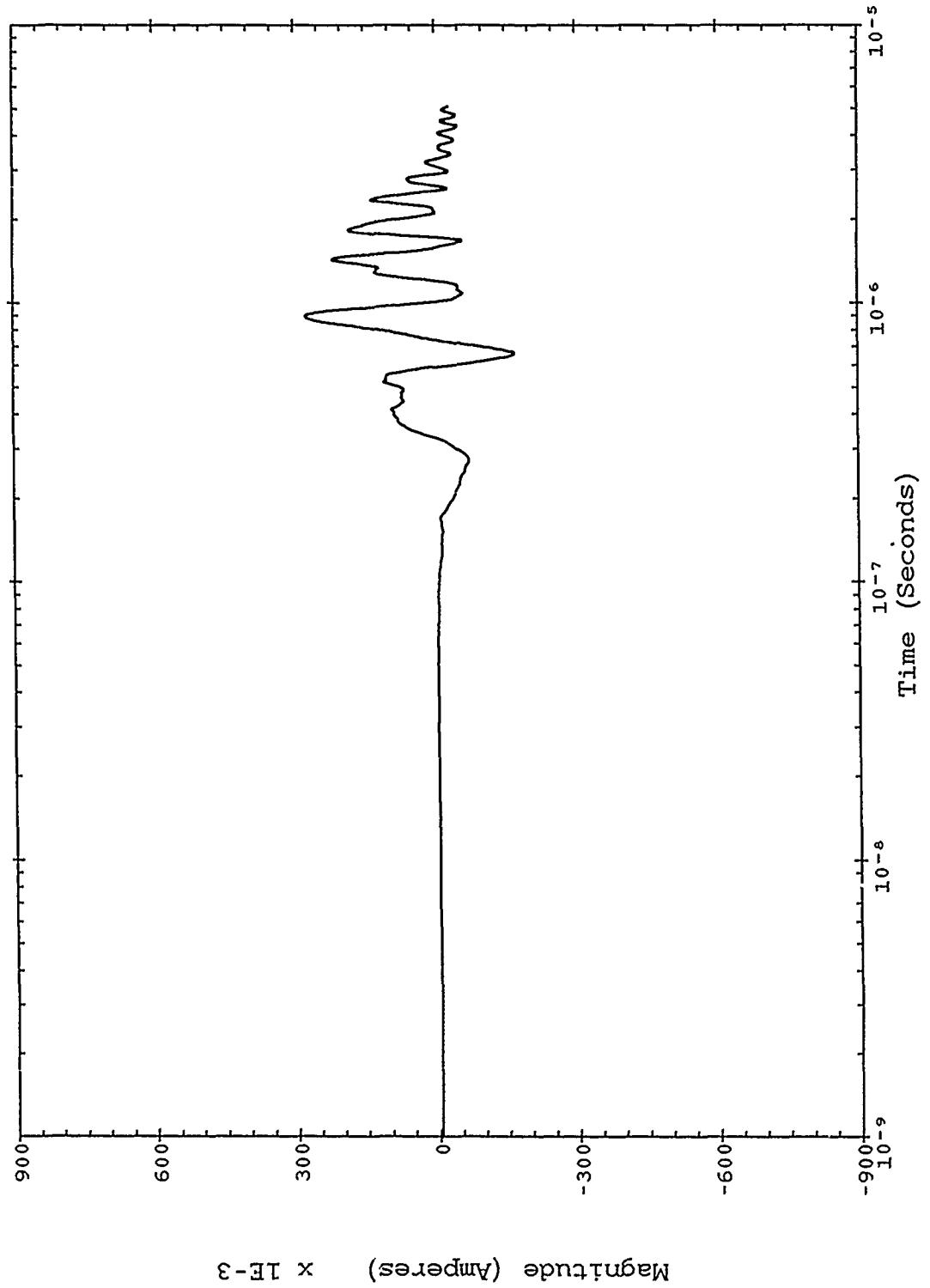


Figure B-376. Severe nearby lightning threat; TP 7407 SN 2166.

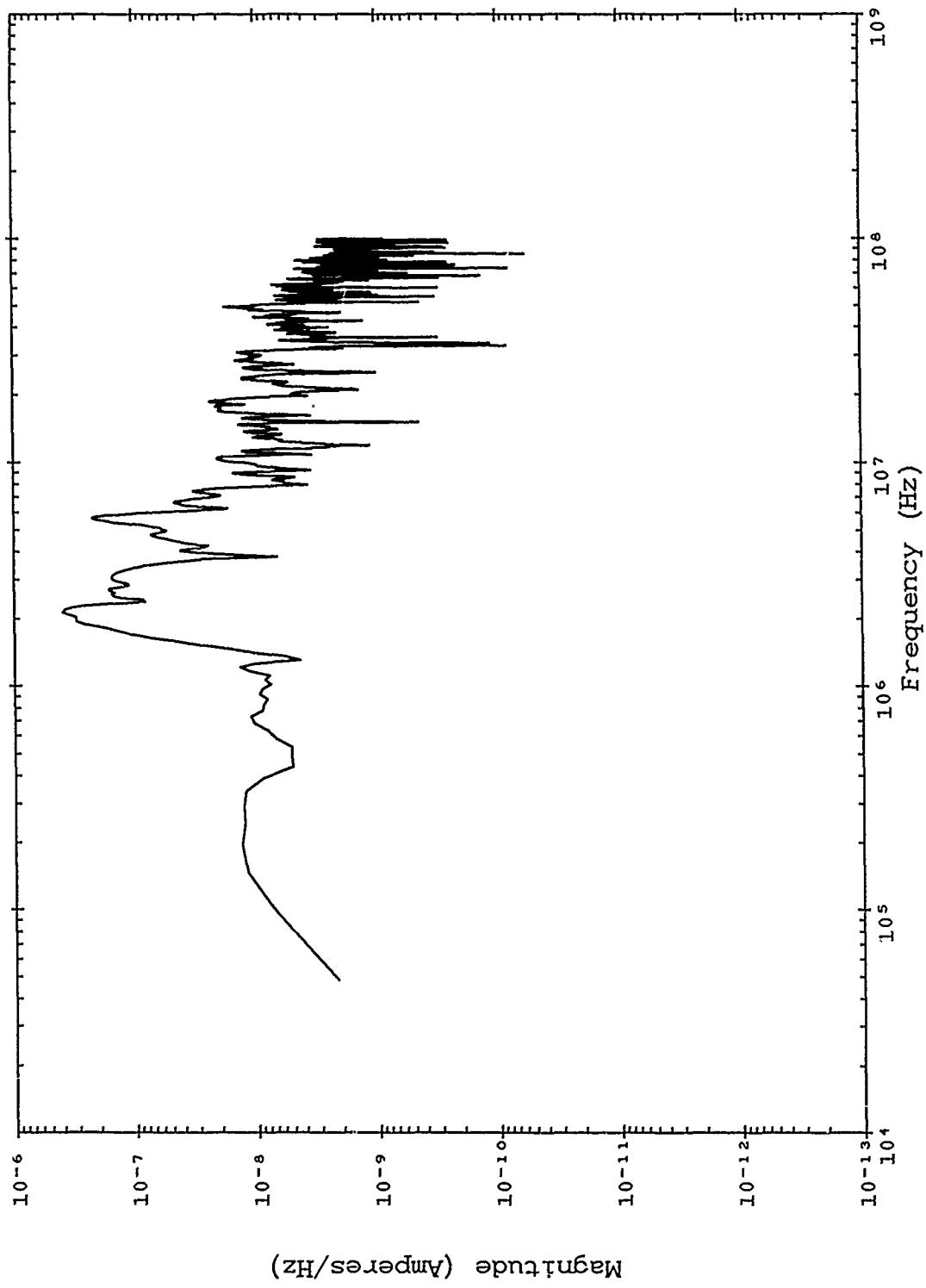


Figure B-377. Double exponential threat; TP 7407 SN 2166.

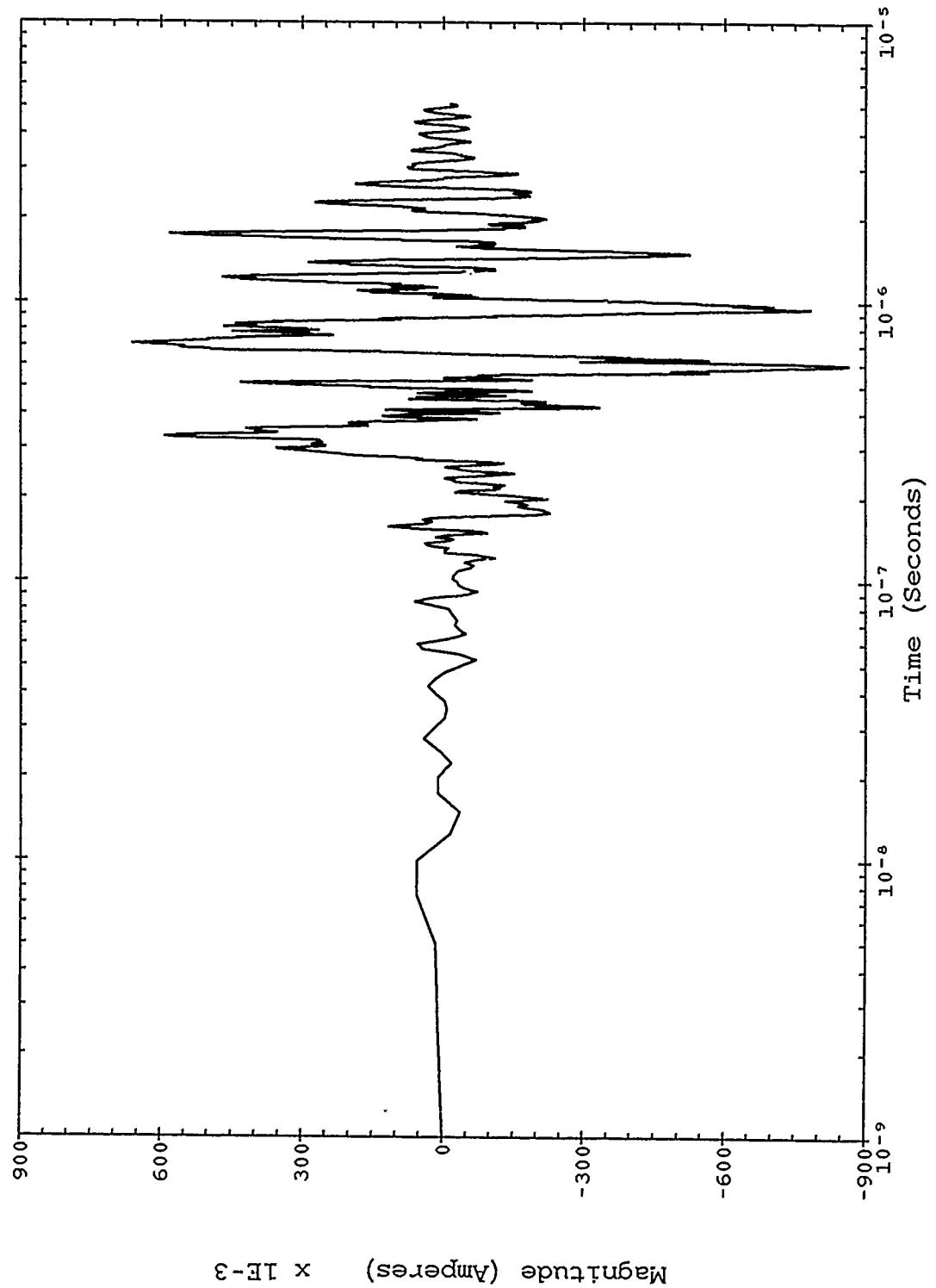


Figure B-378. Double exponential threat; TP 7407 SN 2166.

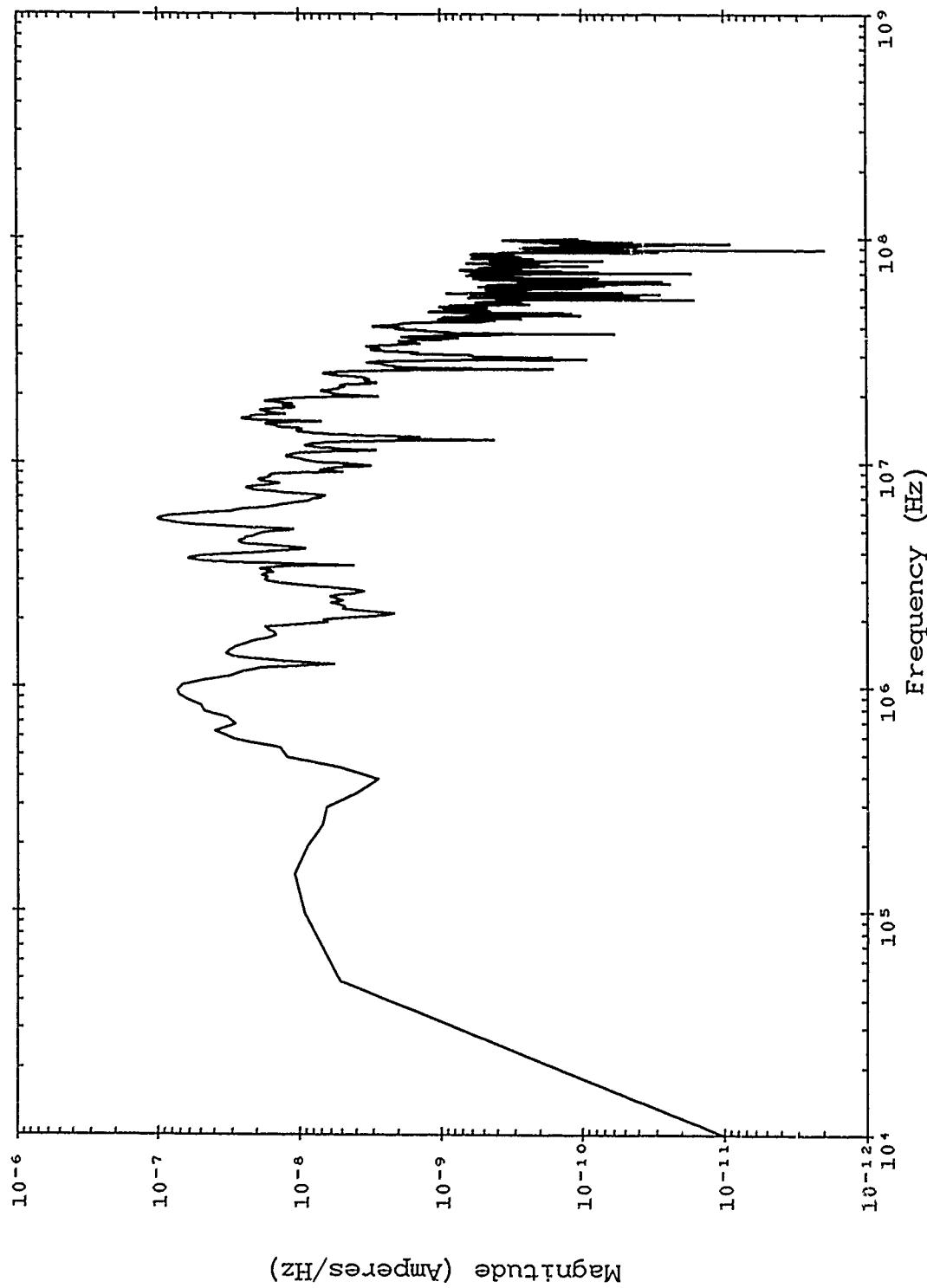


Figure B-379. Corrected TRESTLE data; TP 7513 SN 2638.

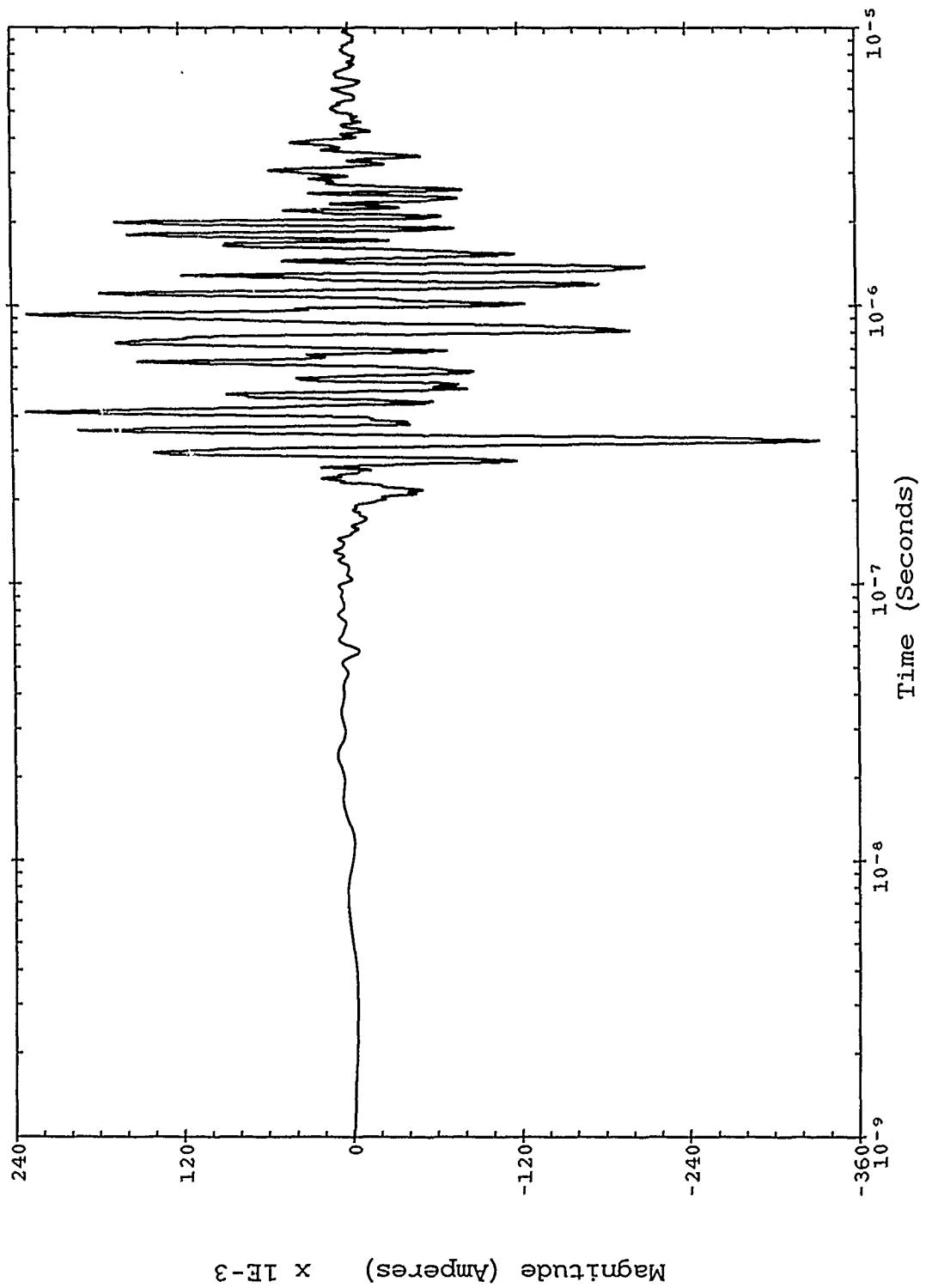


Figure B-380. Corrected TRESTLE data; TP 7513 SN 2638.

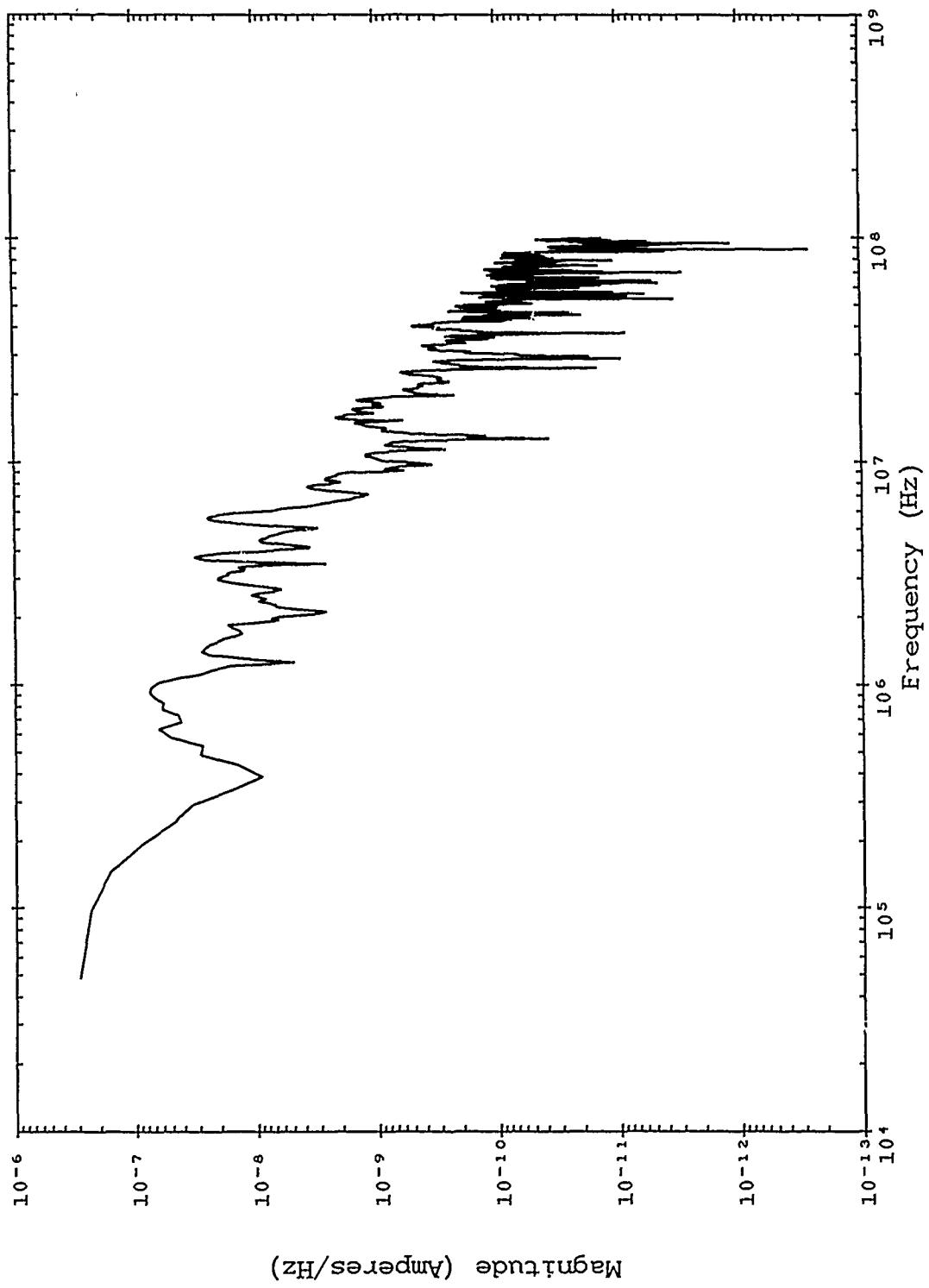


Figure B-381. Severe nearby lightning threat; TP 7513 SN 2638.

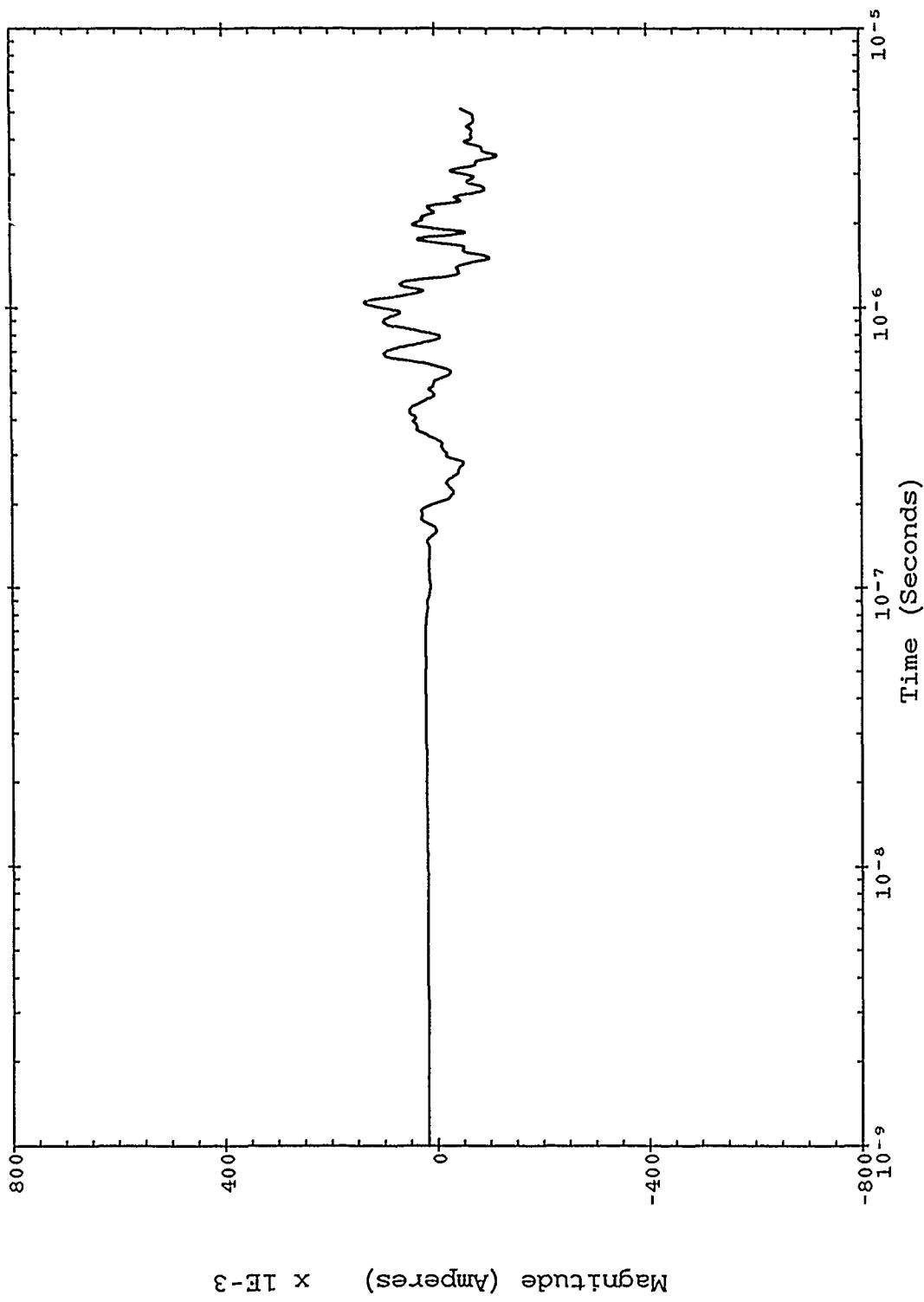


Figure B-382. Severe nearby lightning threat; TP 7513 SN 2638.

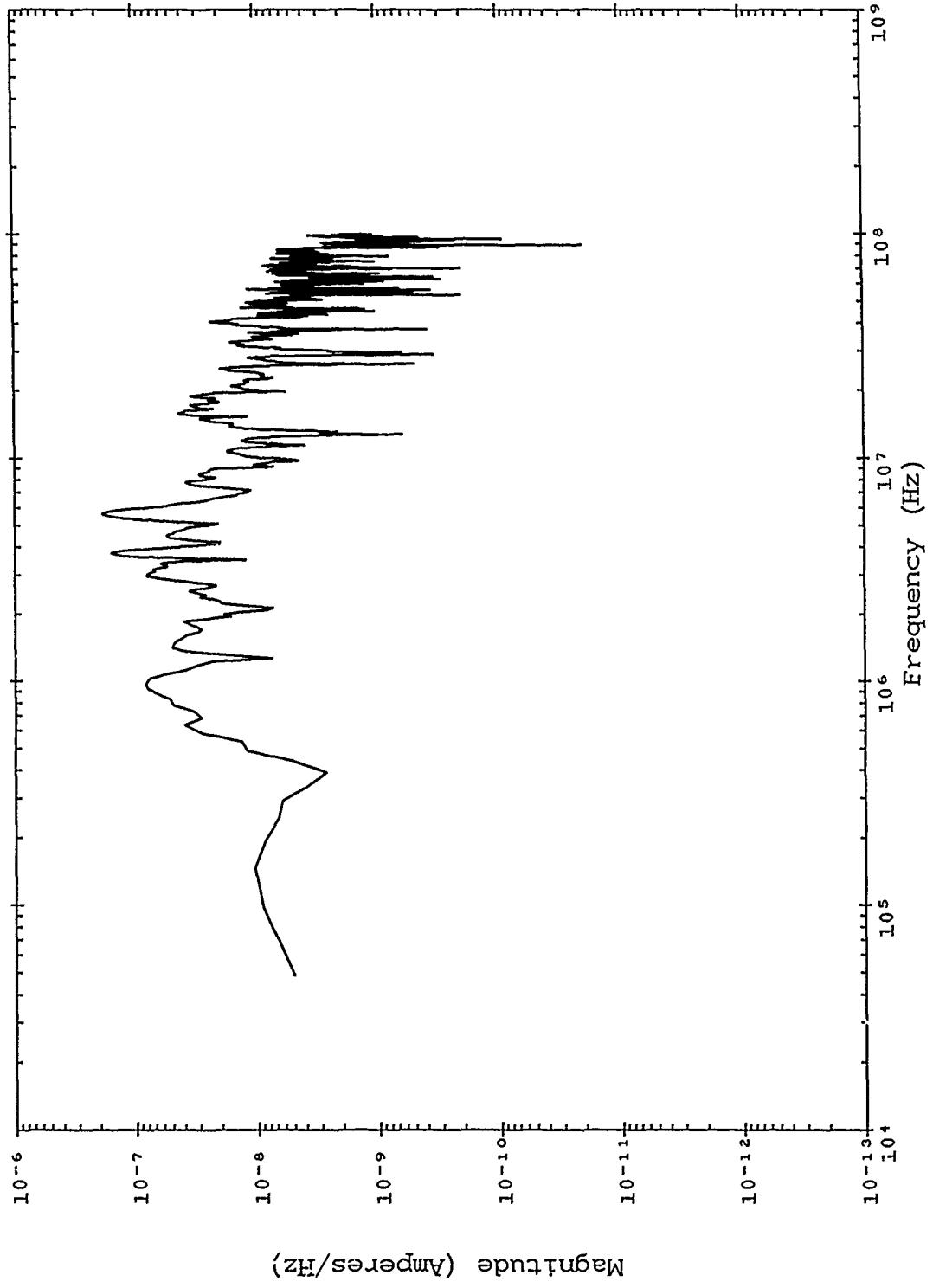


Figure B-383. Double exponential threat; TP 7513 SN 2638.

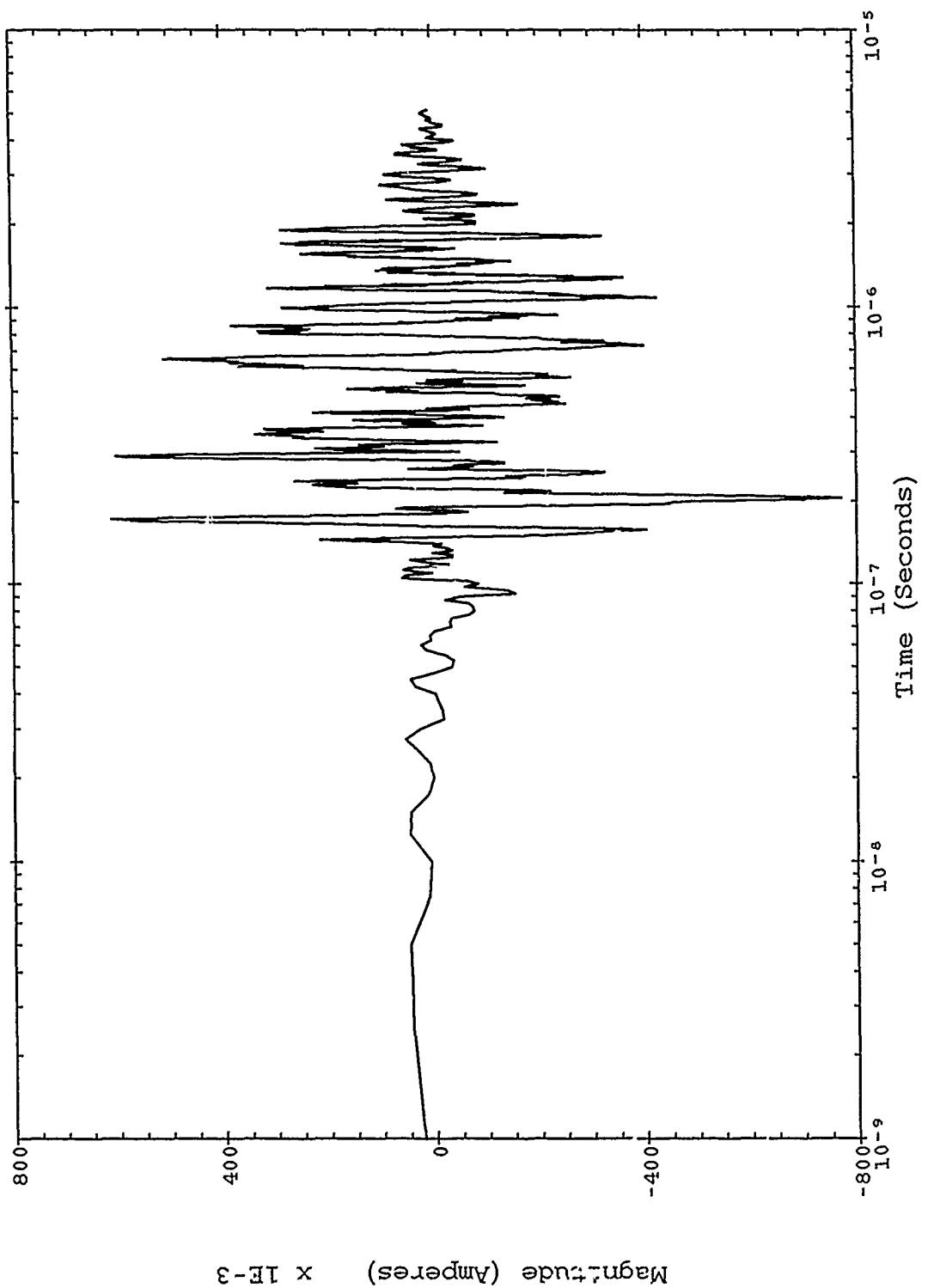


Figure B-384. Double exponential threat; TP 7513 SN 2638.

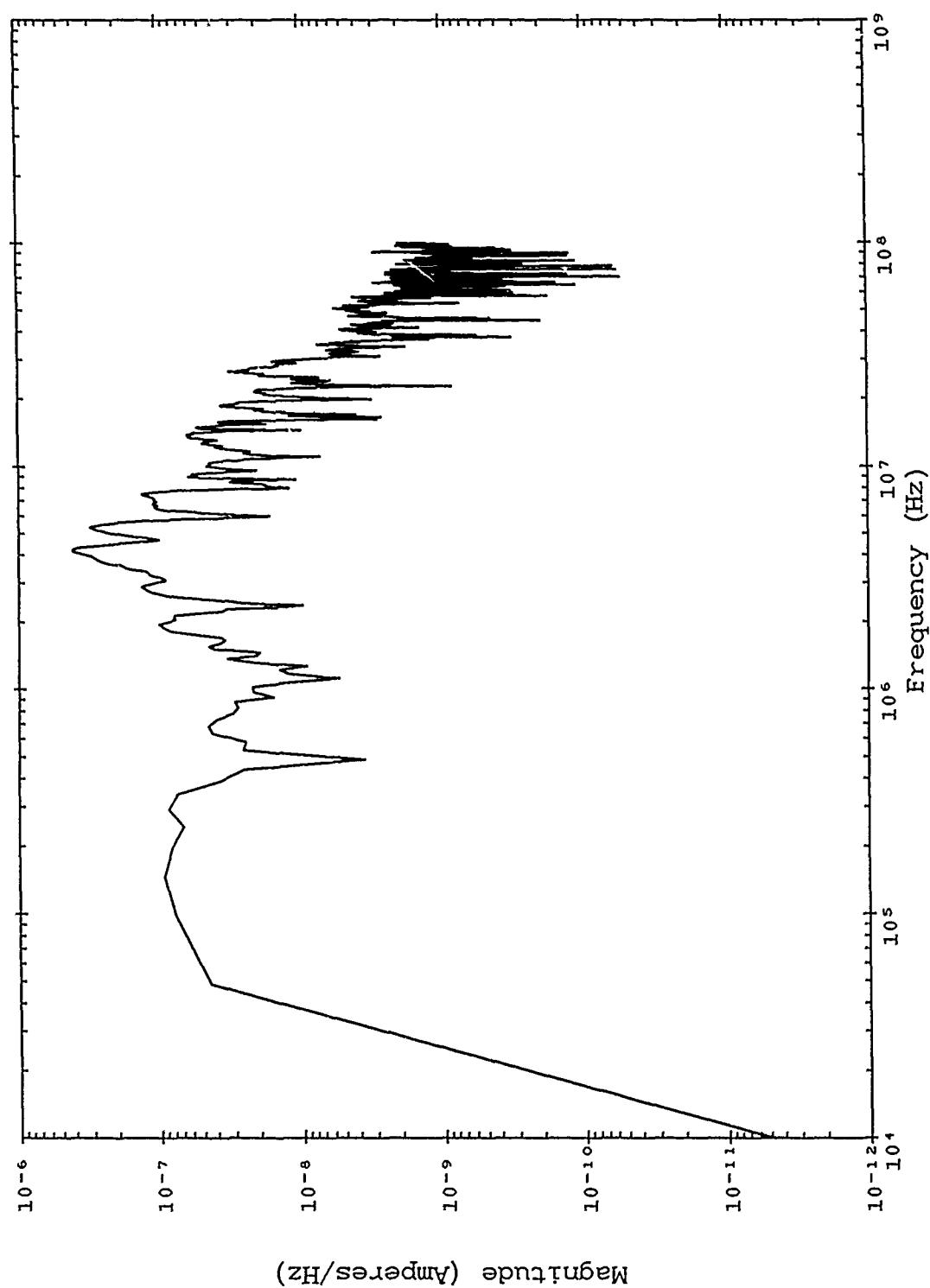


Figure B-385. Corrected TRESTLE data; TP 7516 SN 2528.

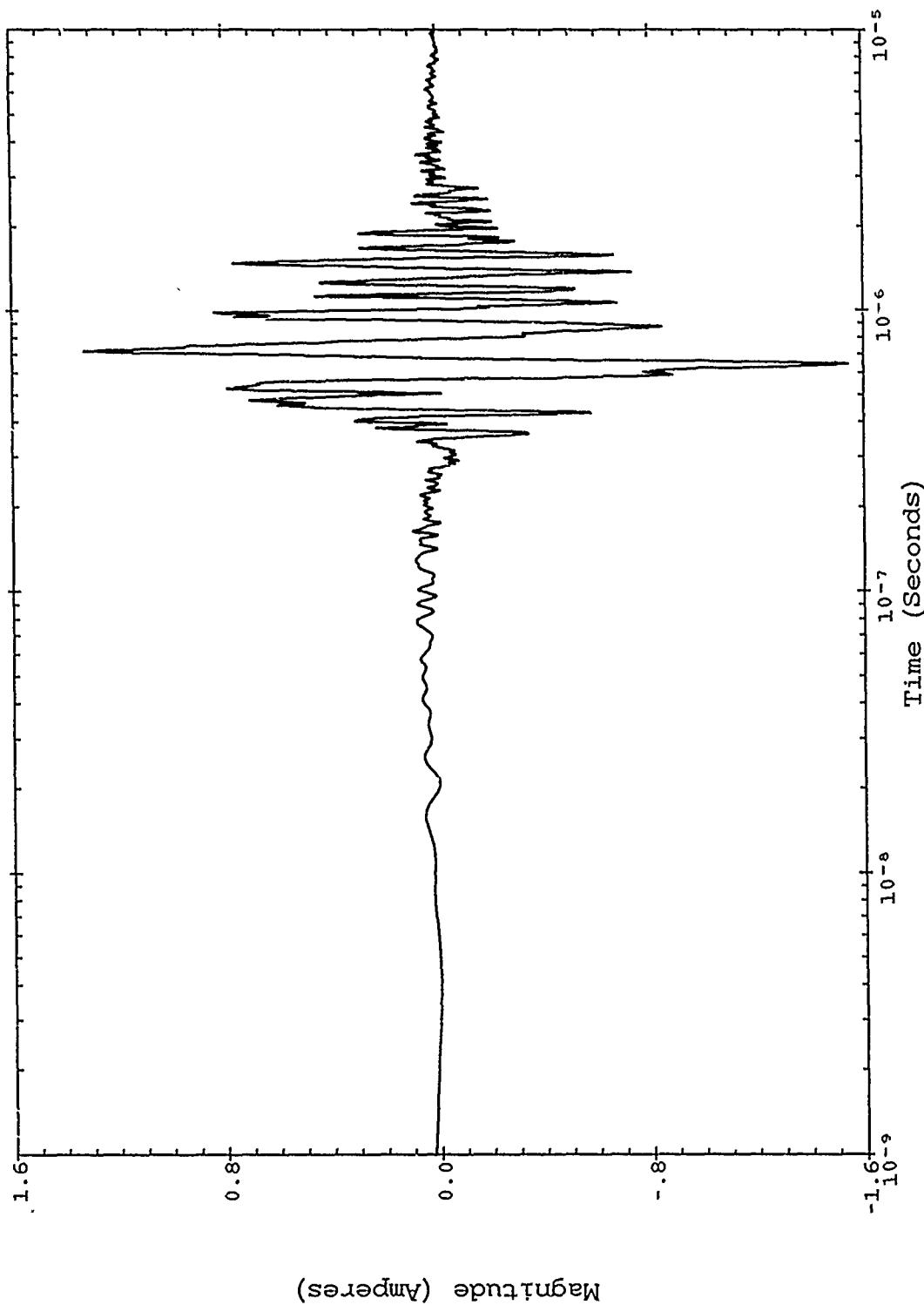


Figure B-386. Corrected TRESTLE data; TP 7516 SN 2528.

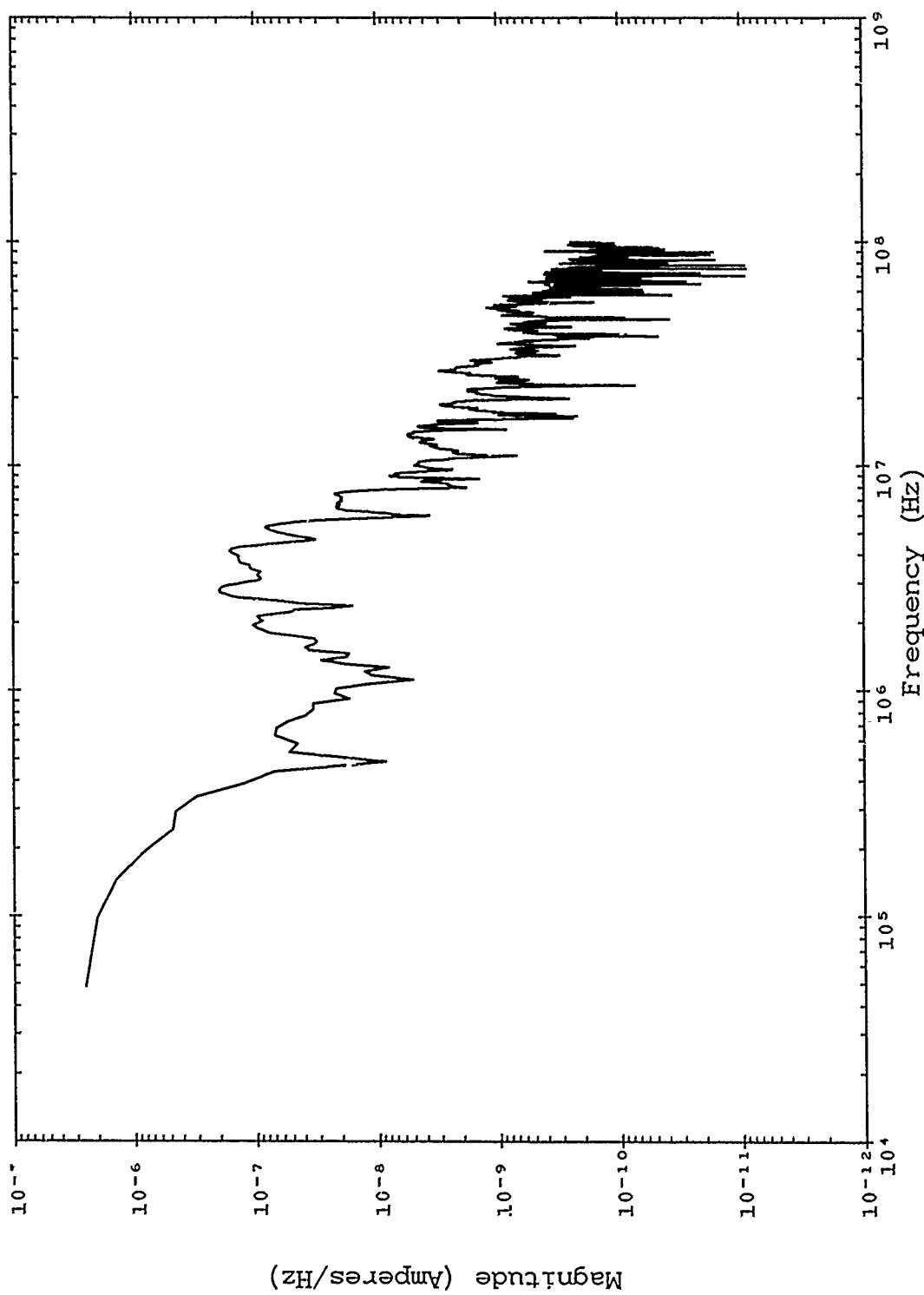


Figure B-387. Severe nearby lightning threat; TP 7516 SN 2528.

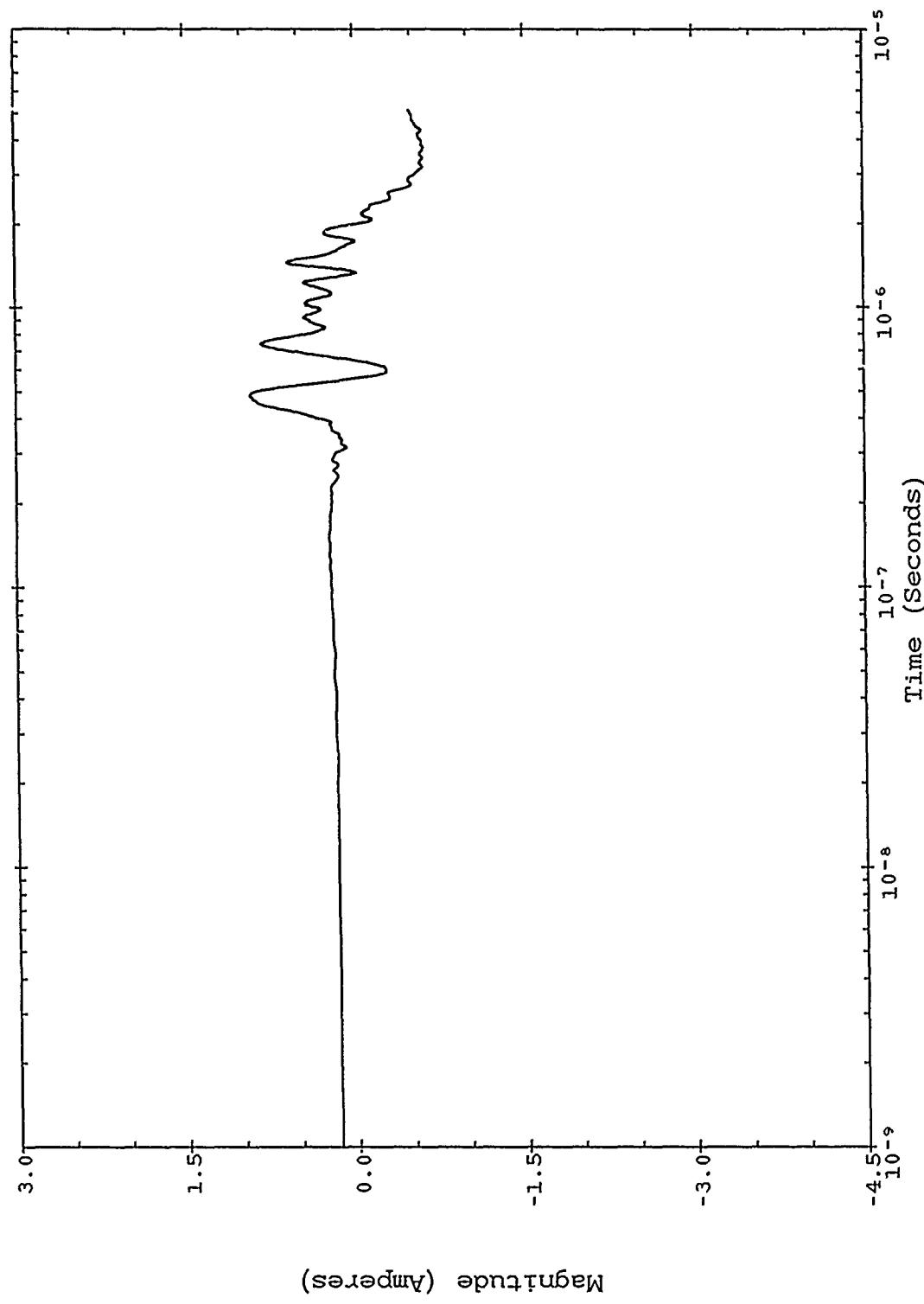


Figure B-388. Severe nearby lightning threat; TP 7516 SN 2528.

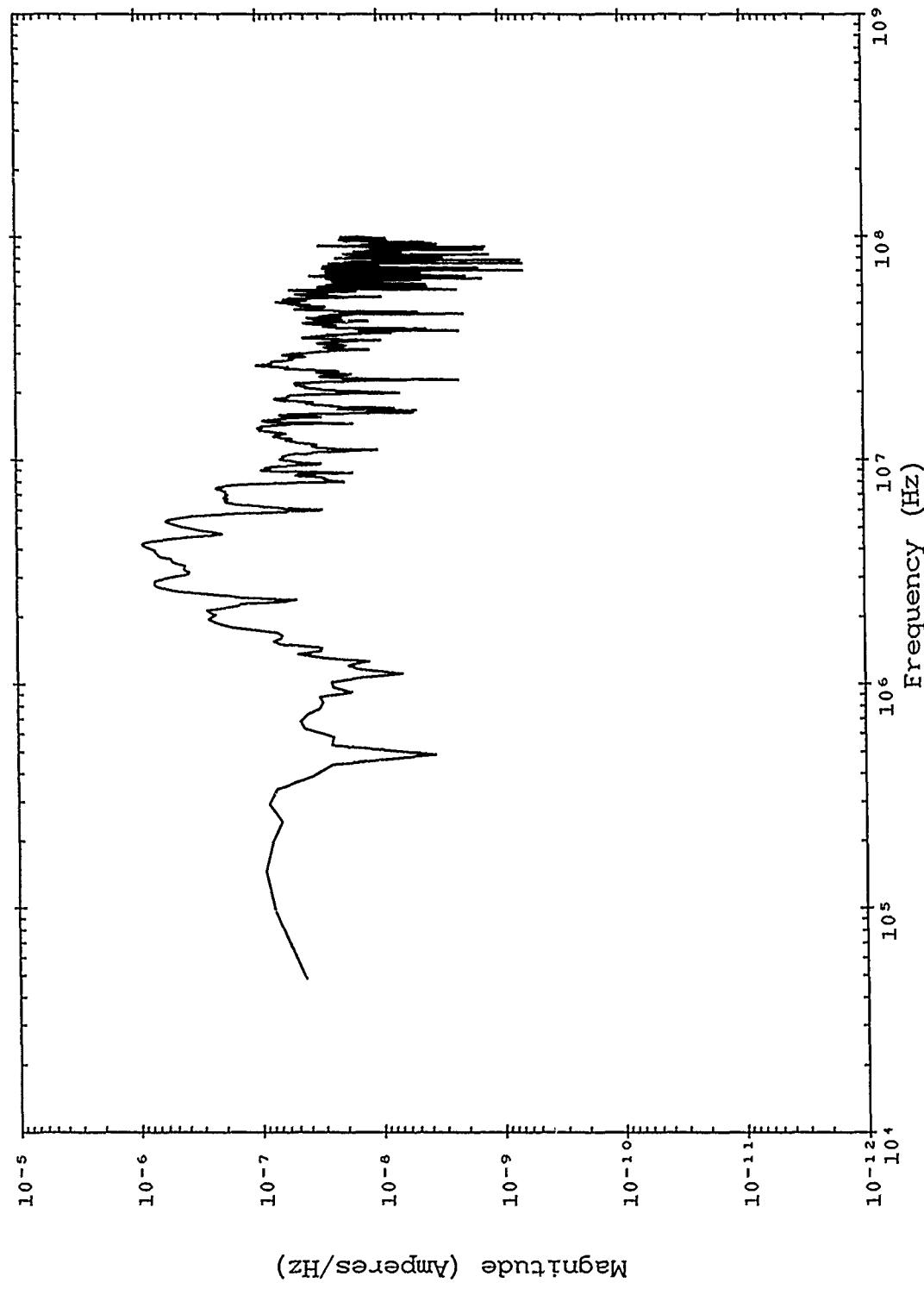


Figure B-389. Double exponential threat; TP 7516 SN 2528.

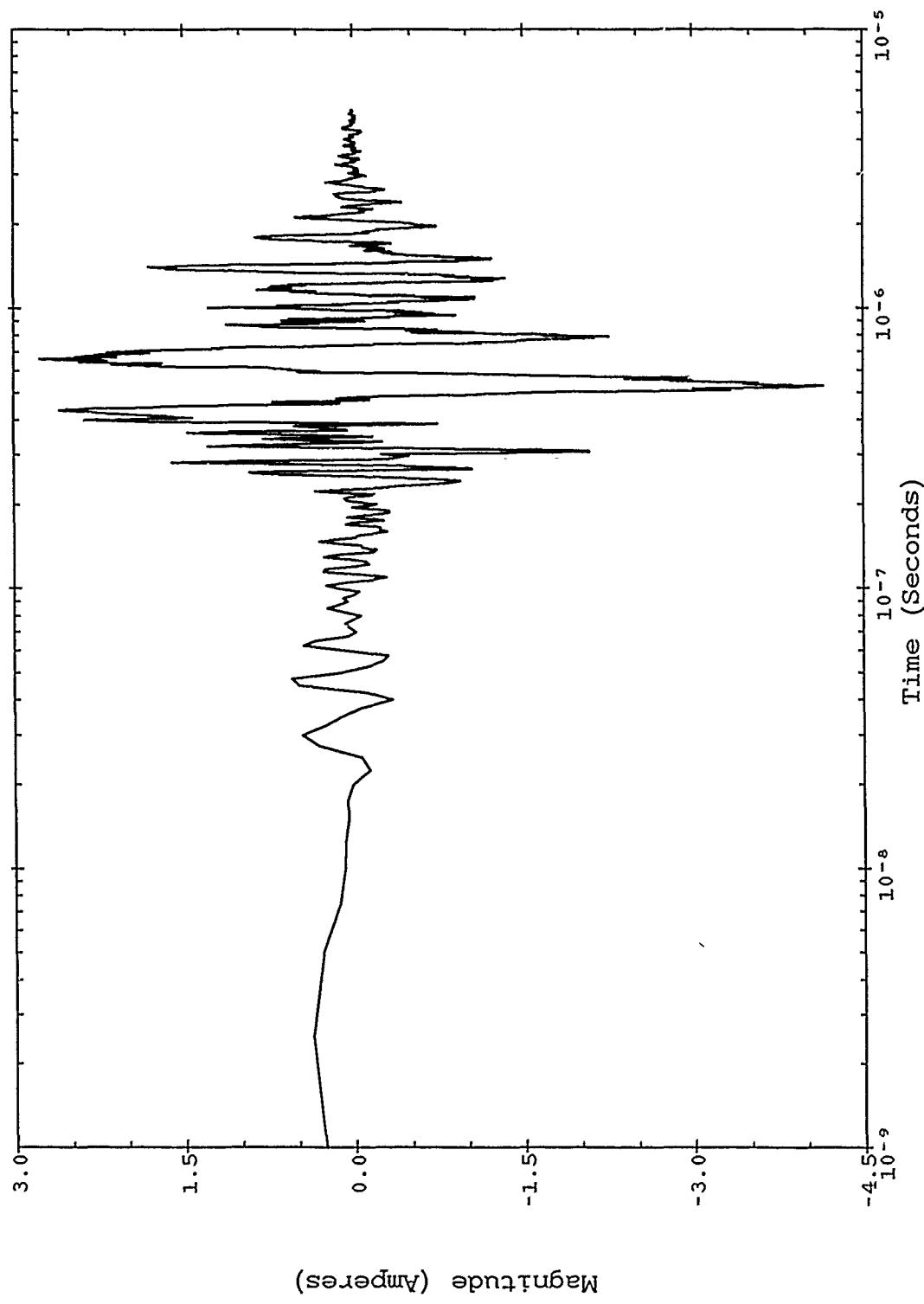


Figure B-390. Double exponential threat; TP 7516 SN 2528.

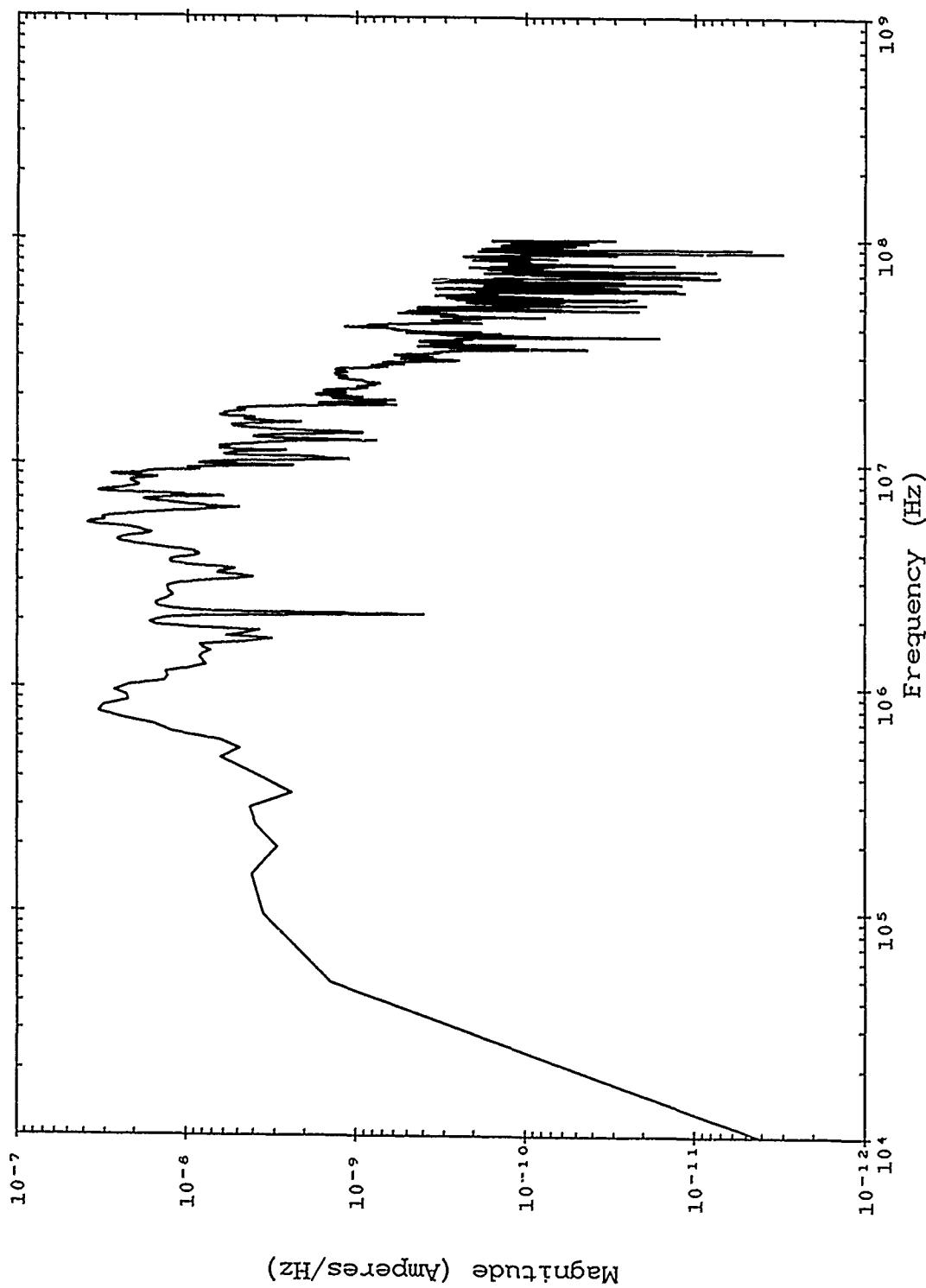


Figure B-391. Corrected TRESTLE data; TP 7681 SN 1720.

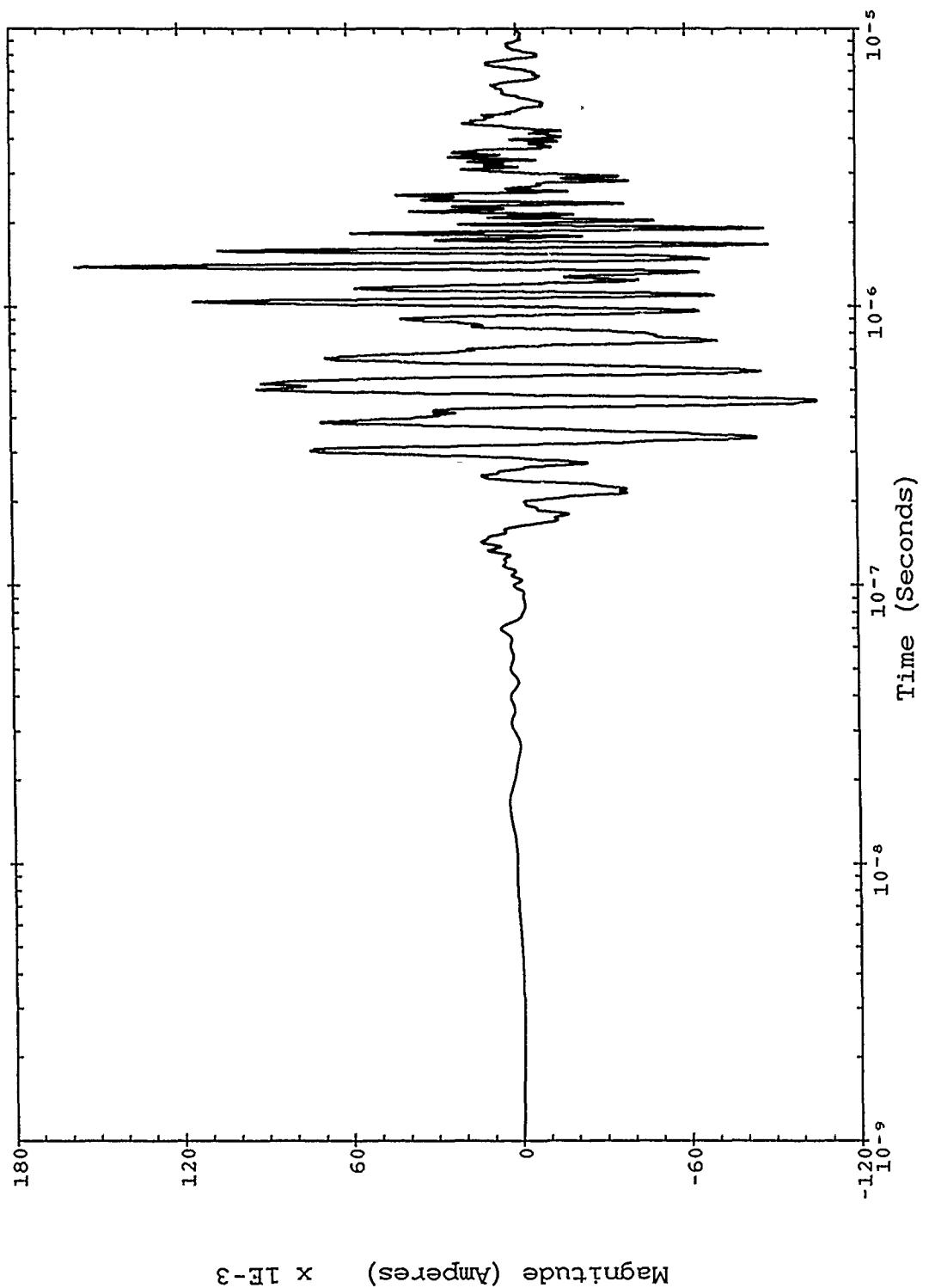


Figure B-392. Corrected TRESTLE data; TP 7681 SN 1720.

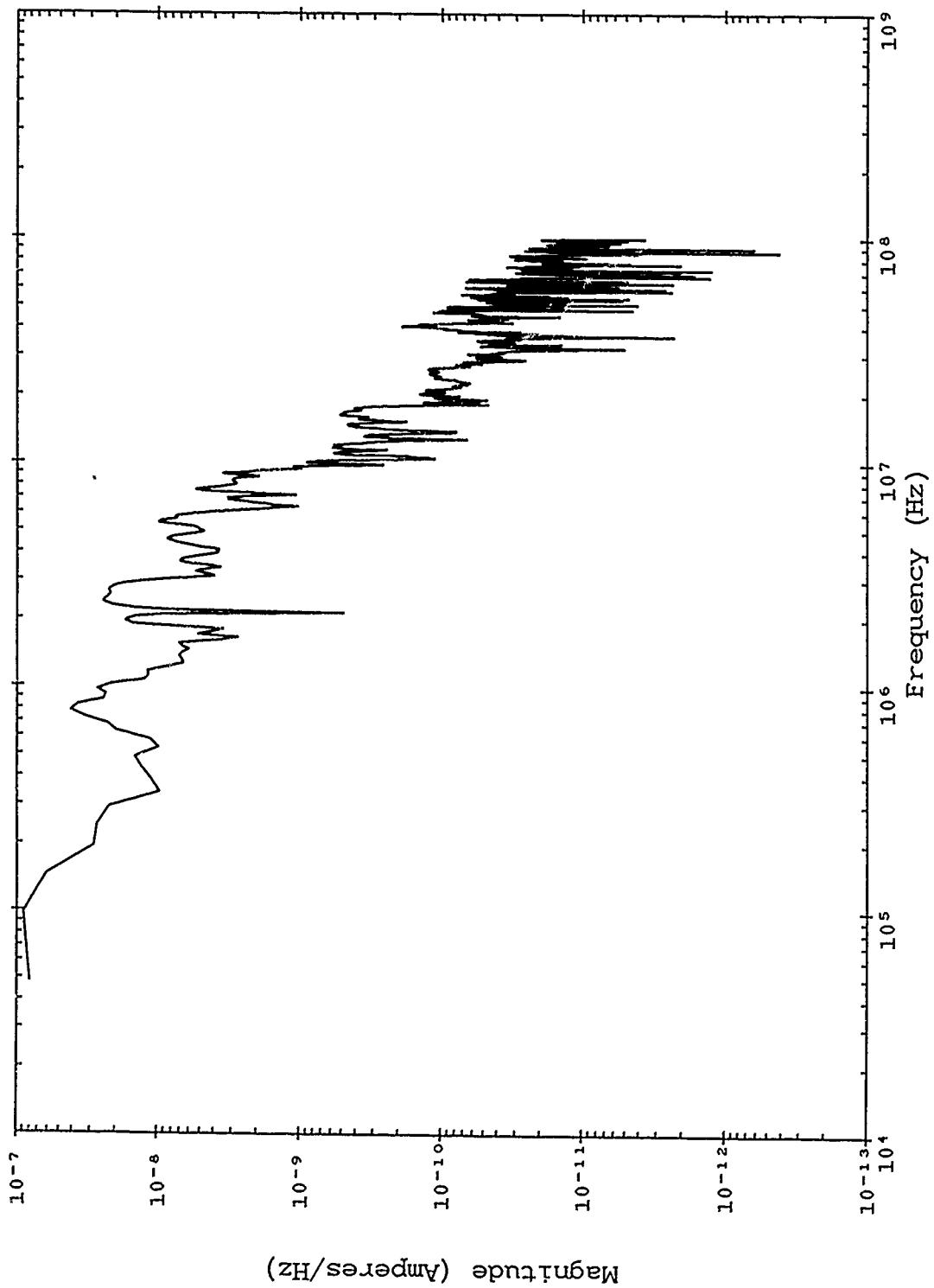


Figure B-393. Severe nearby lightning threat; TP 7681 SN 1720.

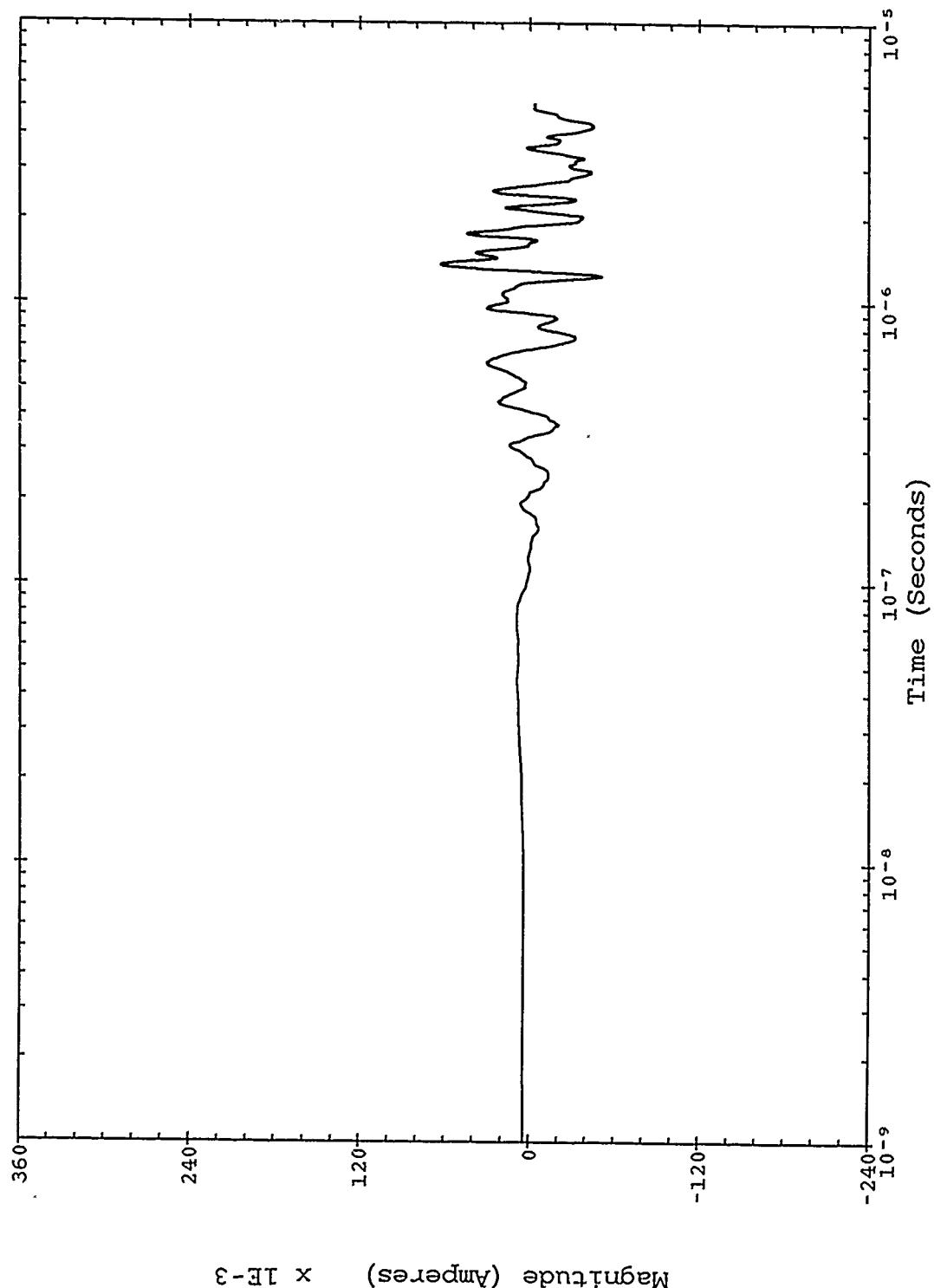


Figure B-394. Severe nearby lightning threat; TP 7681 SN 1720.

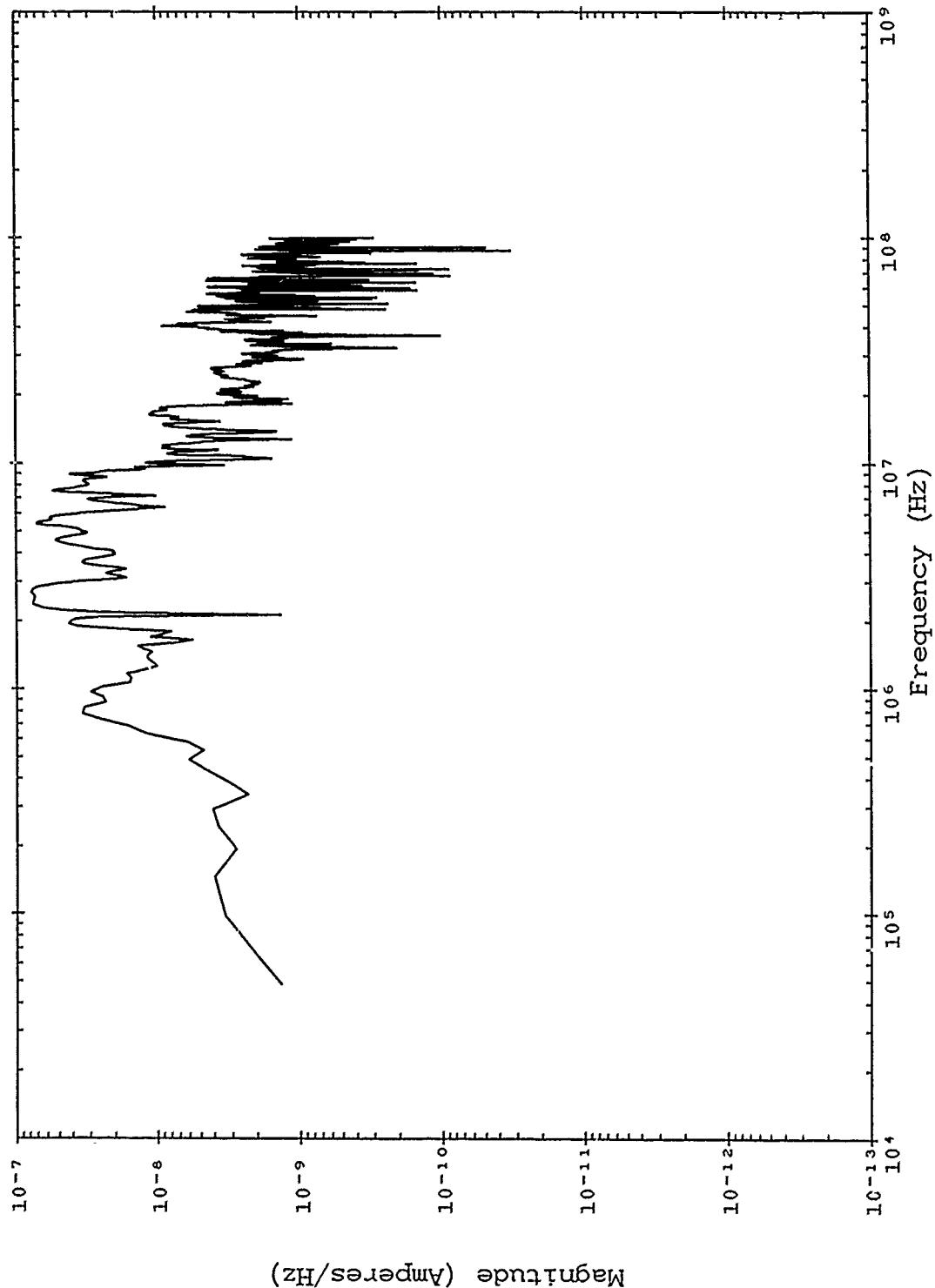


Figure B-395. Double exponential threat; TP 7681 SN 1720.

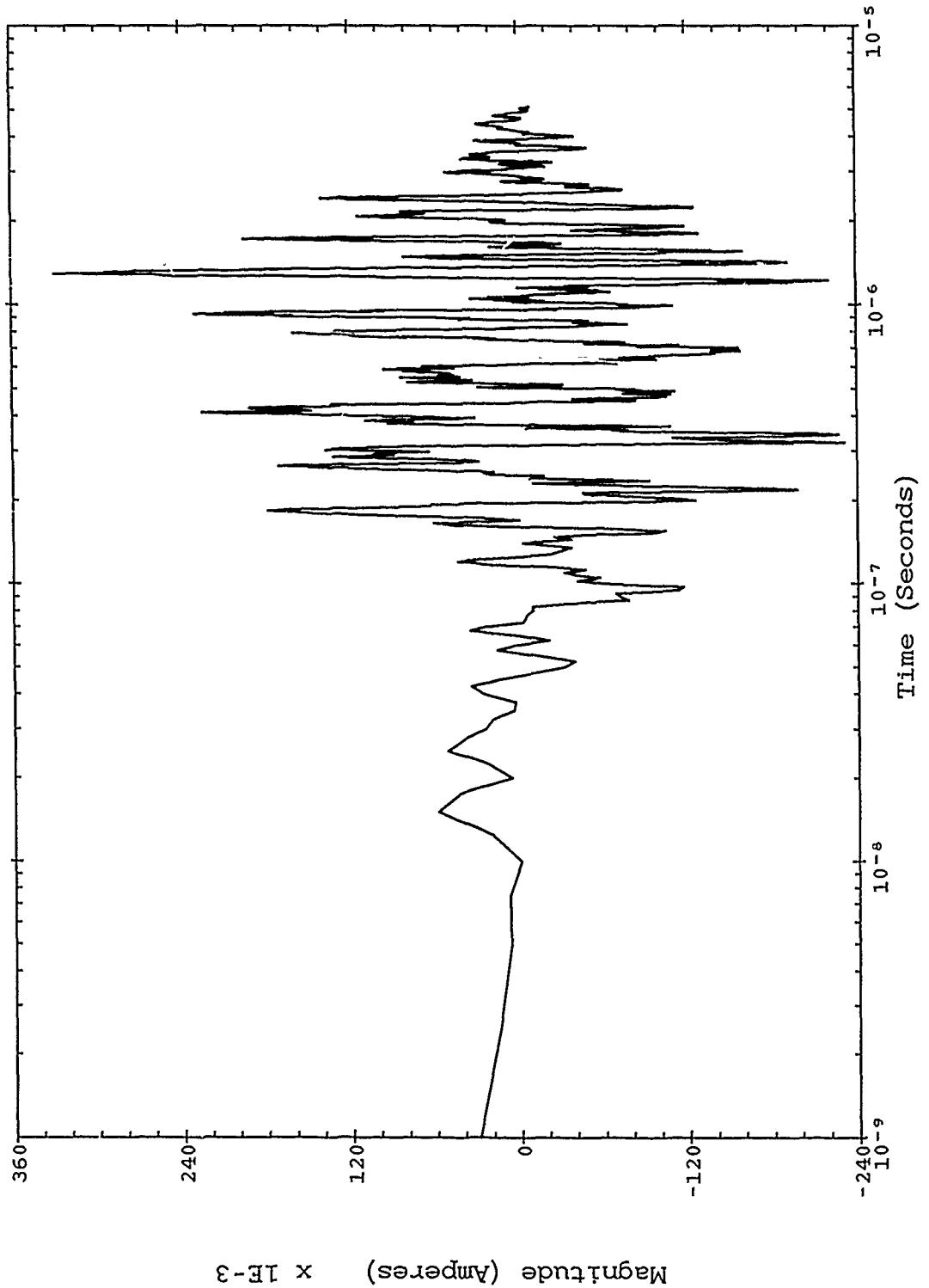


Figure B-396. Double exponential threat; TP 7681 SN 1720.

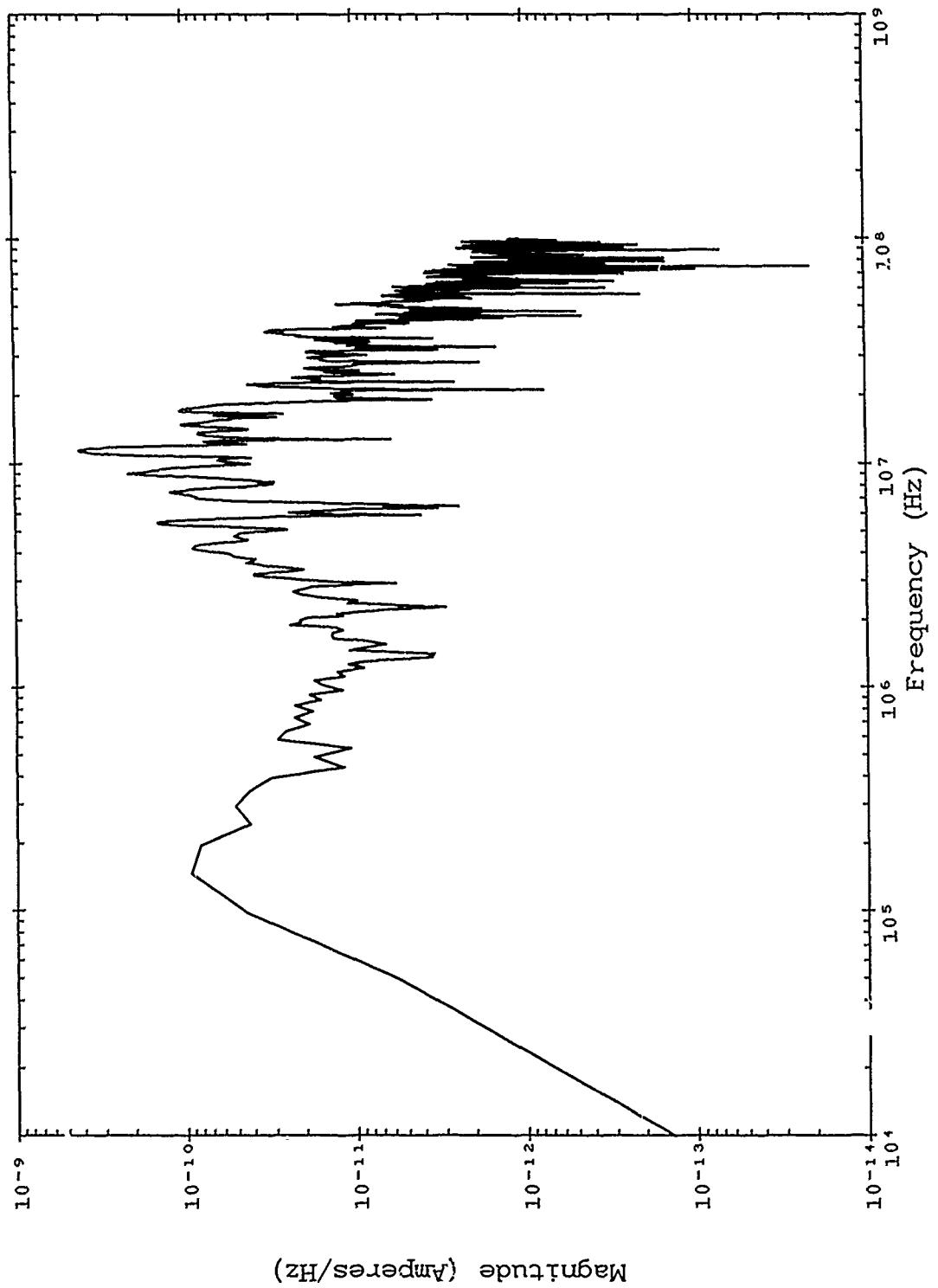


Figure B-397. Corrected TRESTLE data; TP 7873 SN 2626.

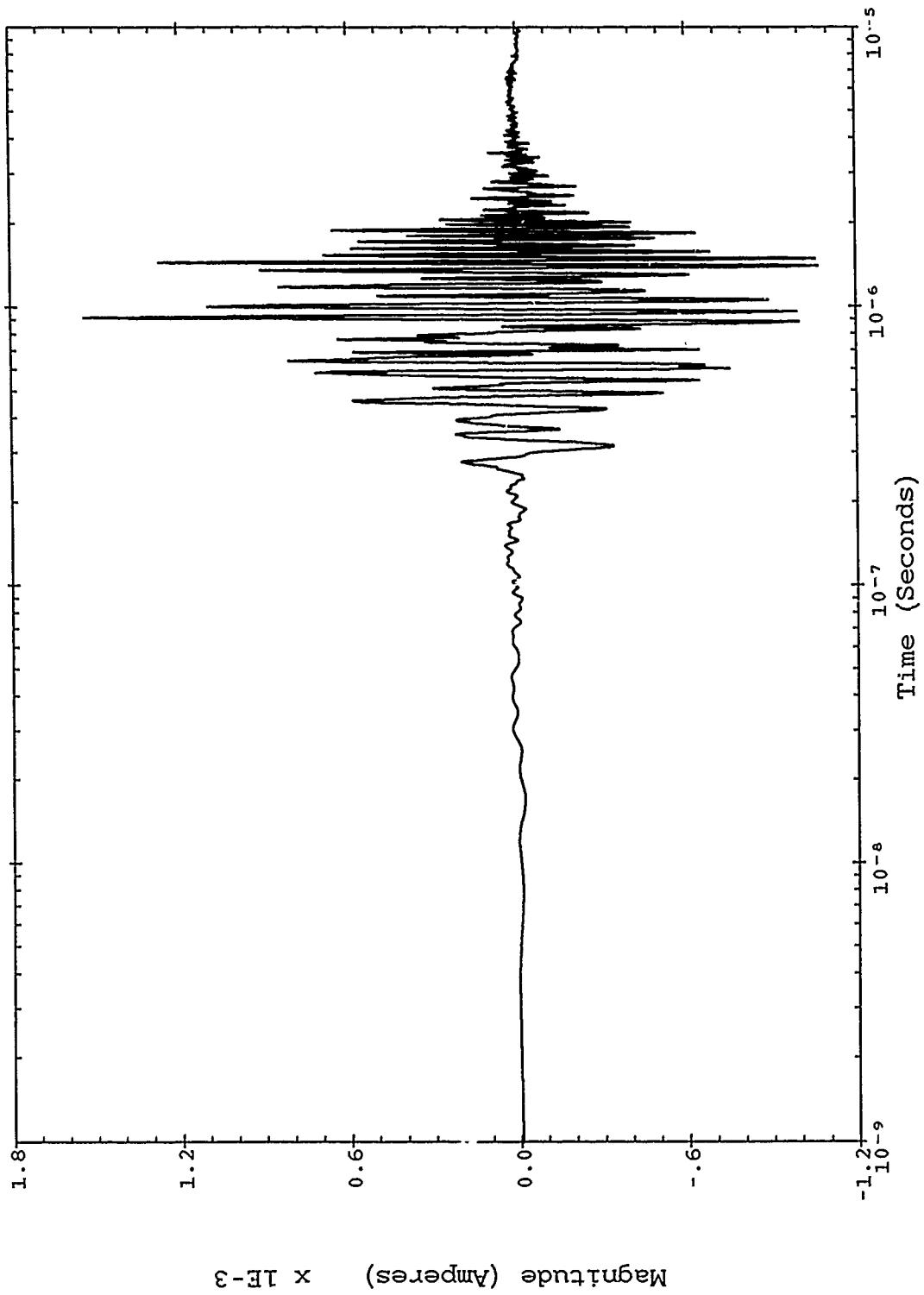


Figure B-398. Corrected TRESTLE data; TP 7873 SN 2626.

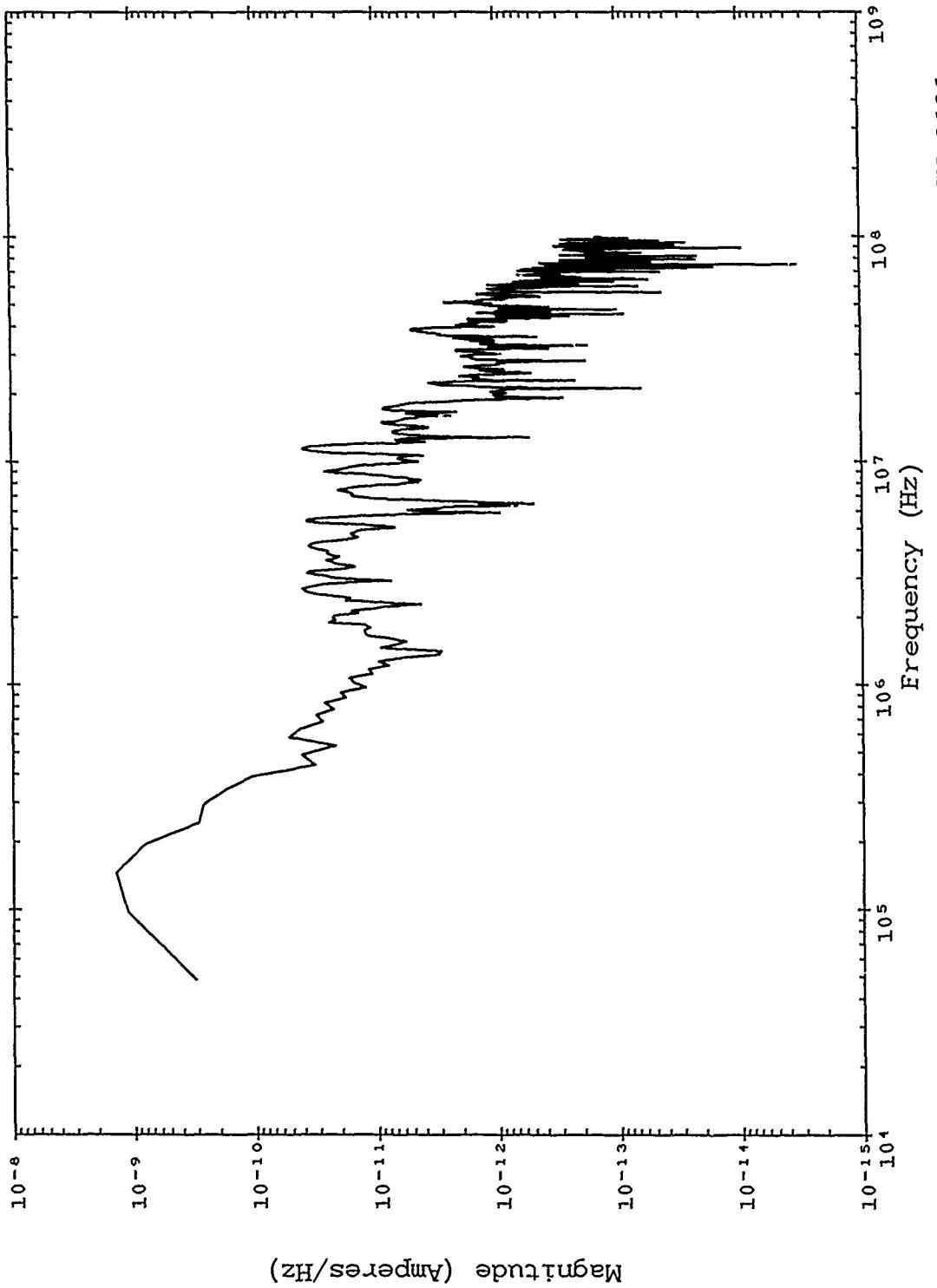


Figure B-399. Severe nearby lightning threat; TP 7873 SN 2626.

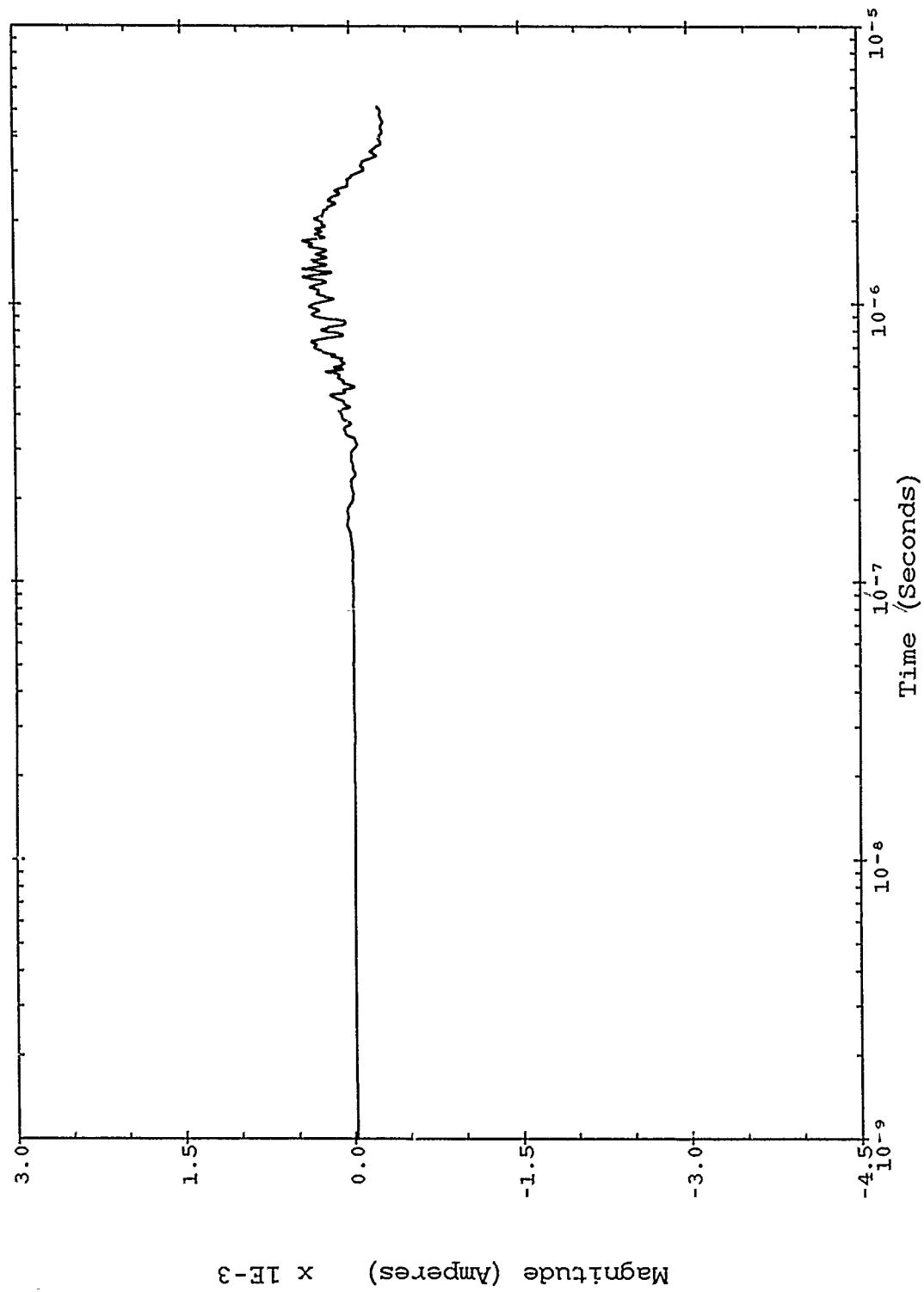


Figure B-400. Severe nearby lightning threat; TP 7873 SN 2626.

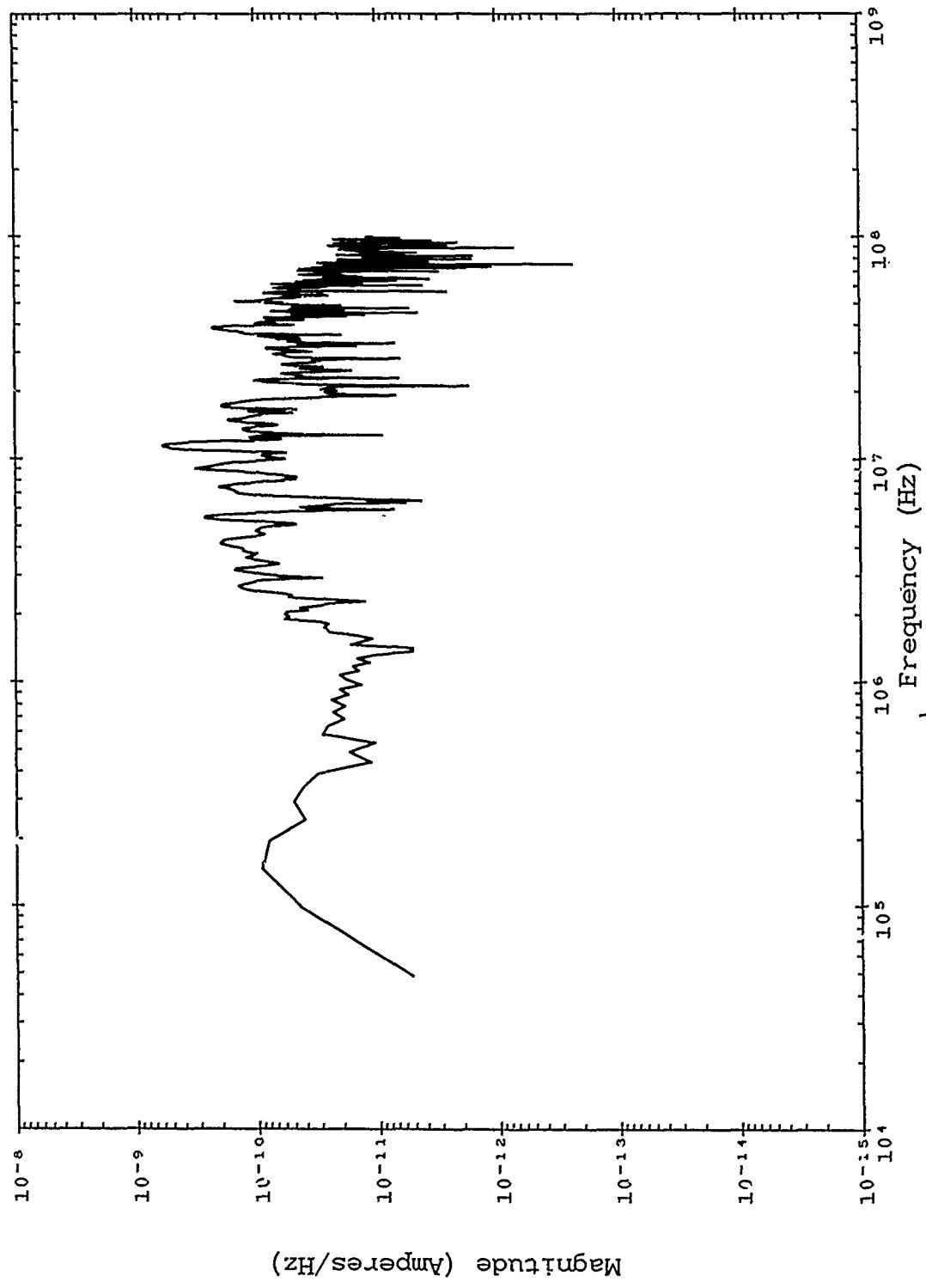


Figure B-401. Double exponential threat; TP 7873 SN 2626.

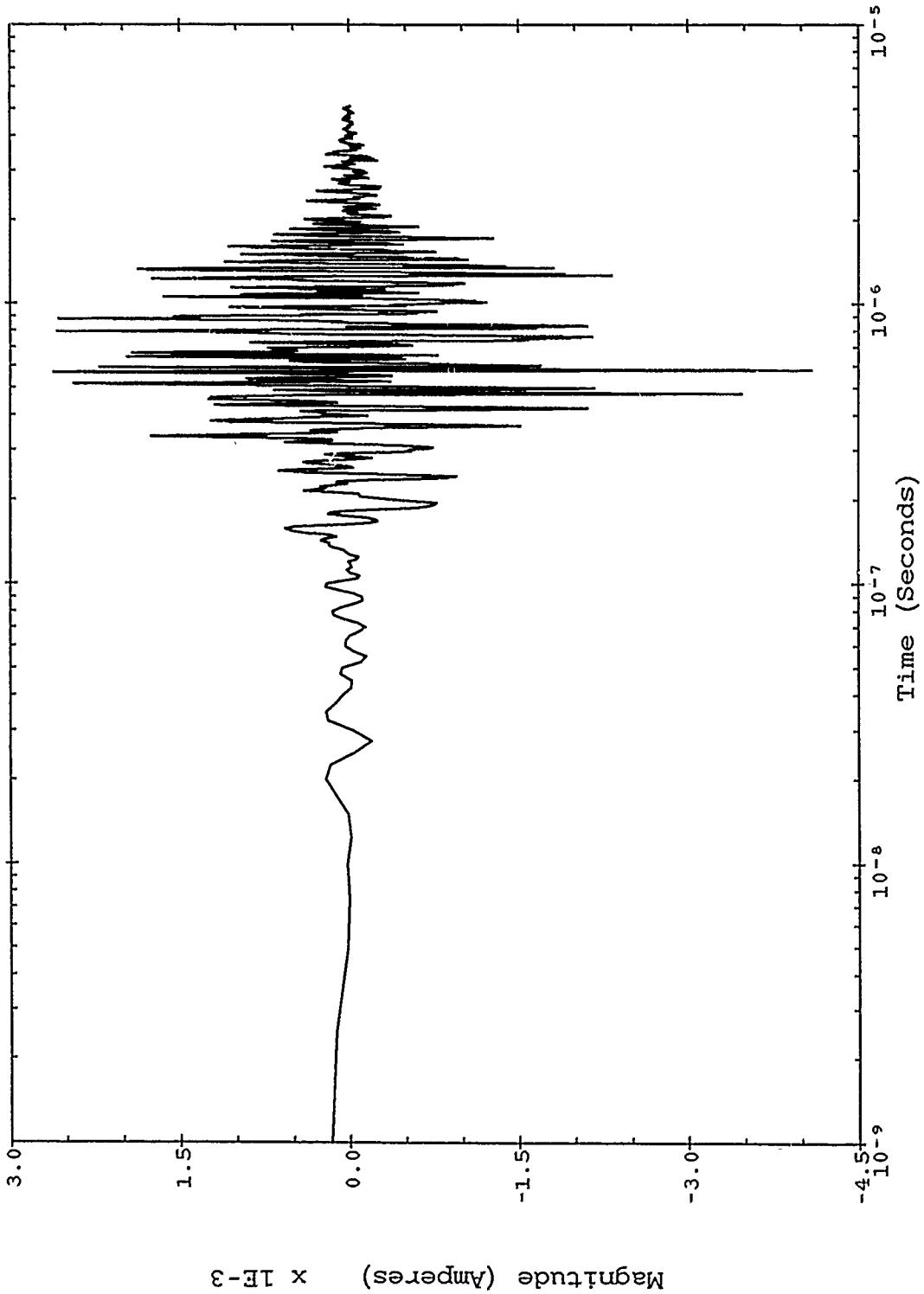


Figure B-402. Double exponential threat; TP 7873 SN 2626.

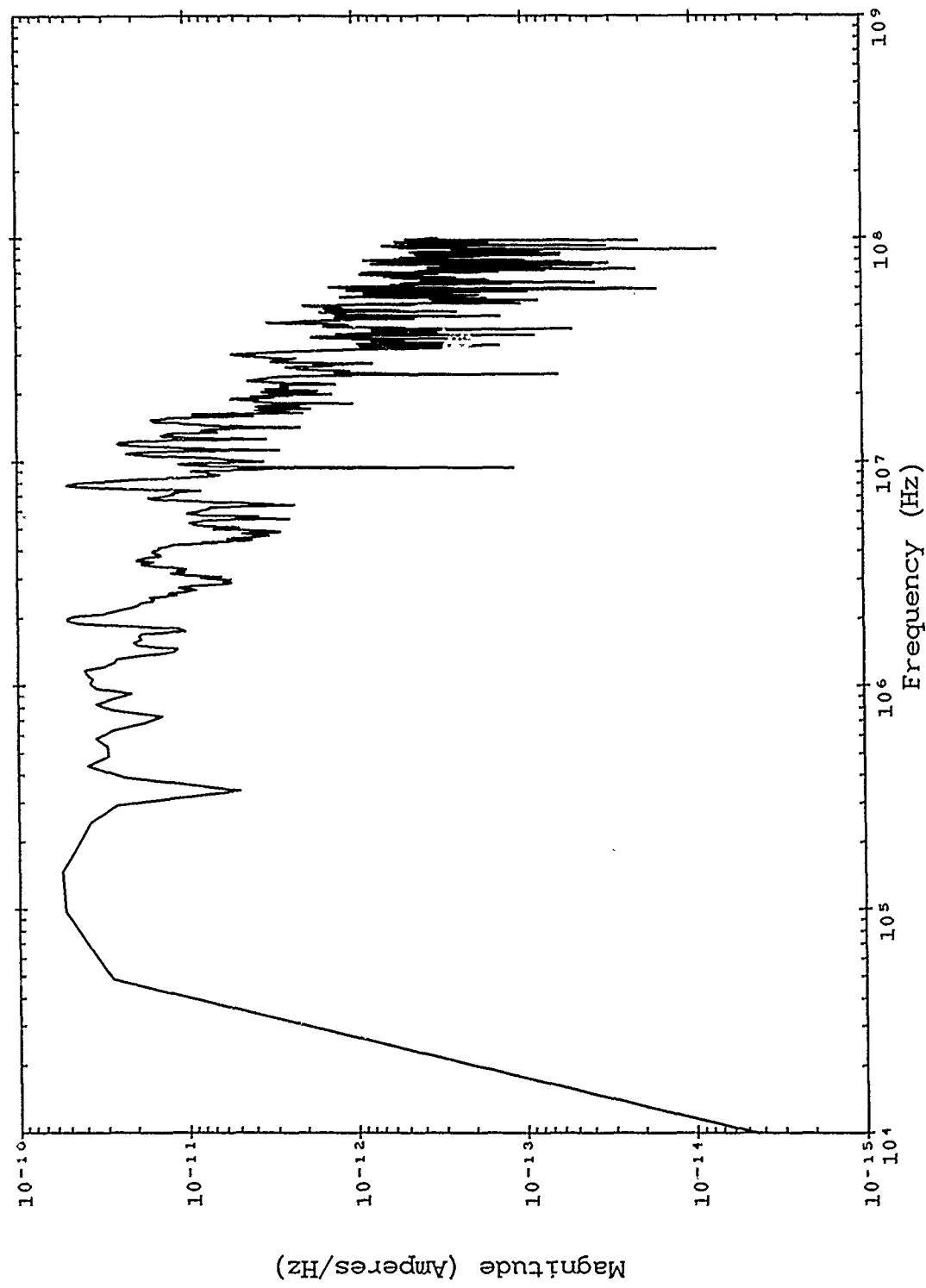


Figure B-403. Corrected TRESTLE data; TP 8027 SN 2594.

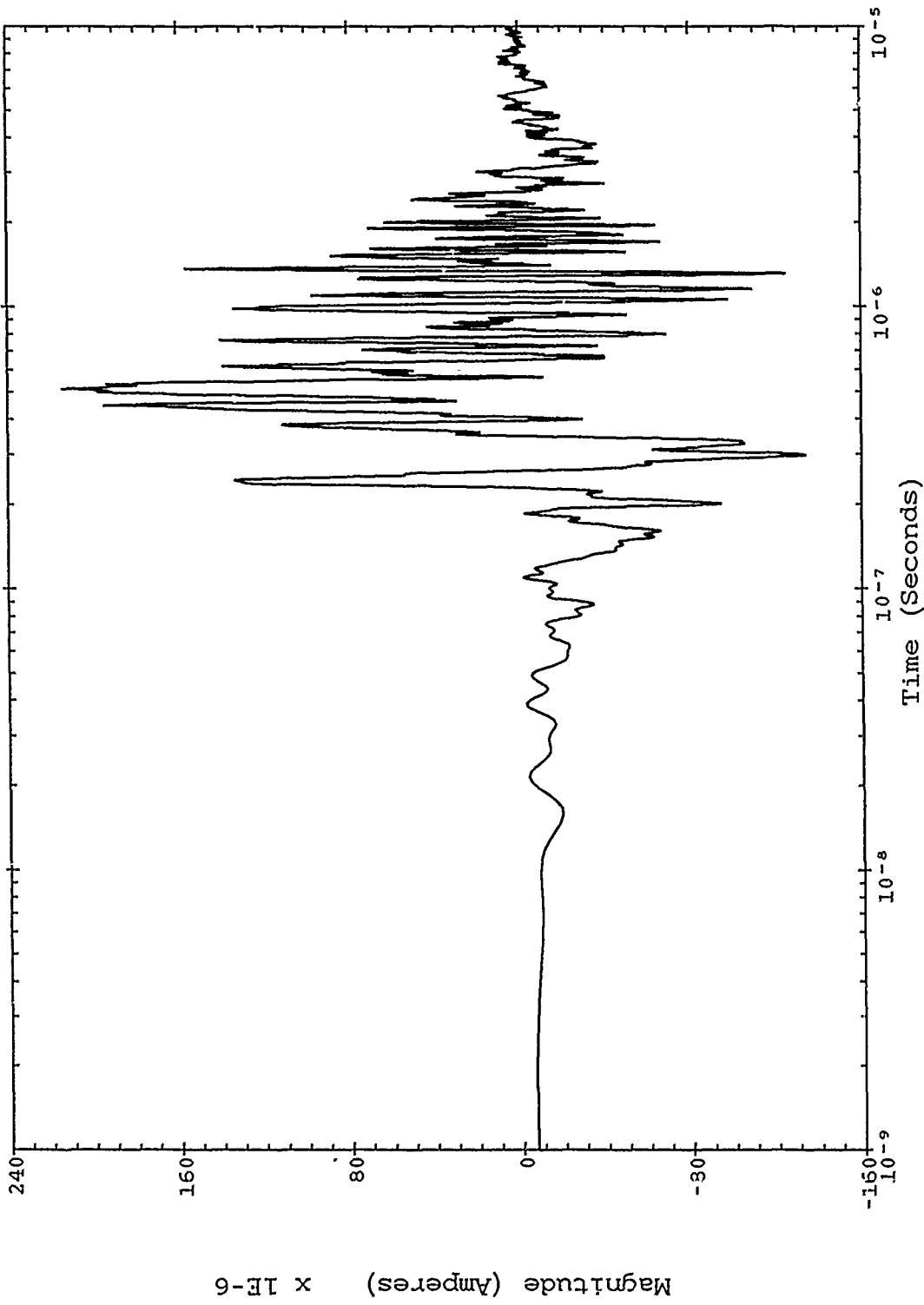


Figure B-404. Corrected TRESTLE data; TP 8027 SN 2594.

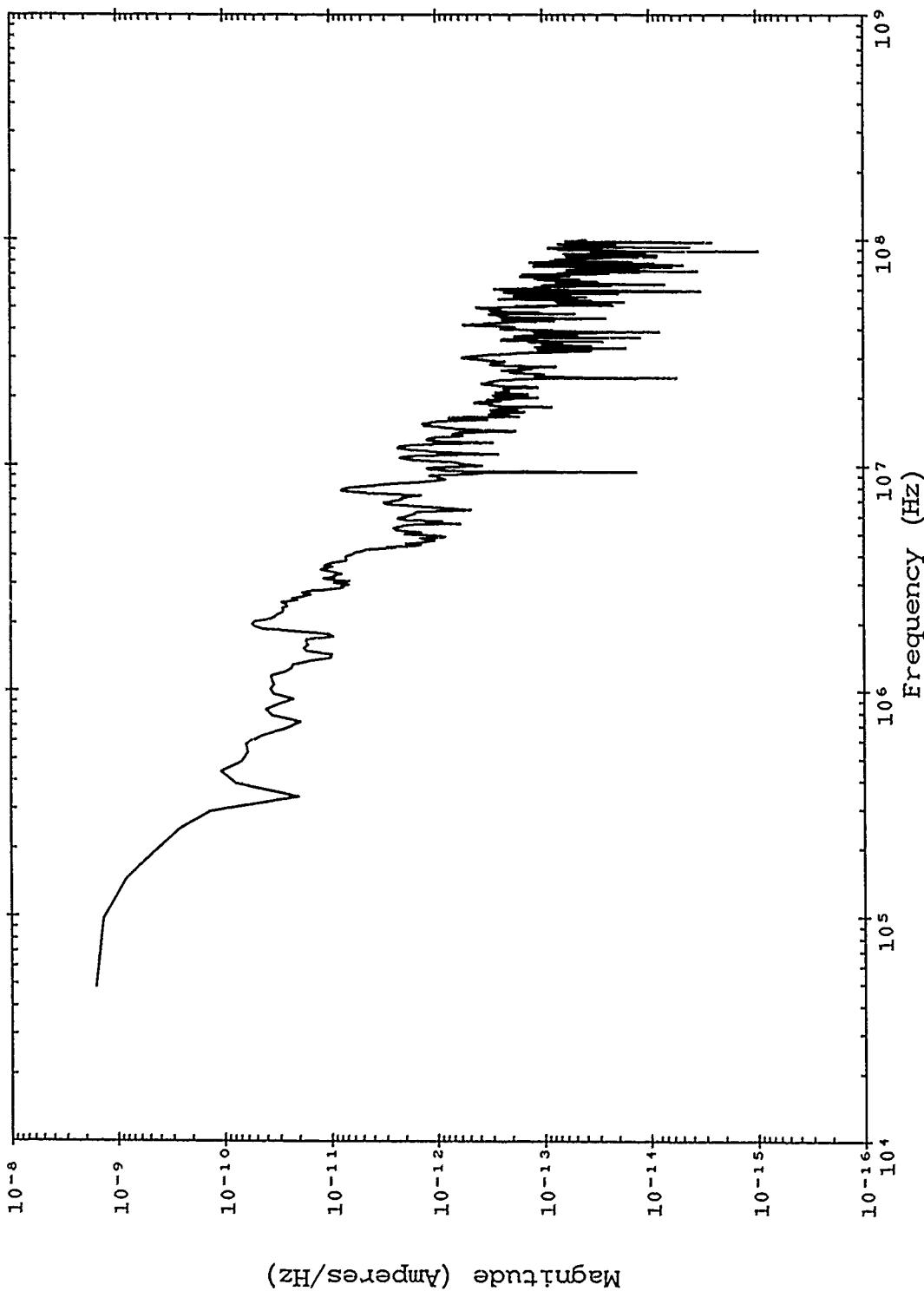


Figure B-405. Severe nearby lightning threat; TP 8027 SN 2594.

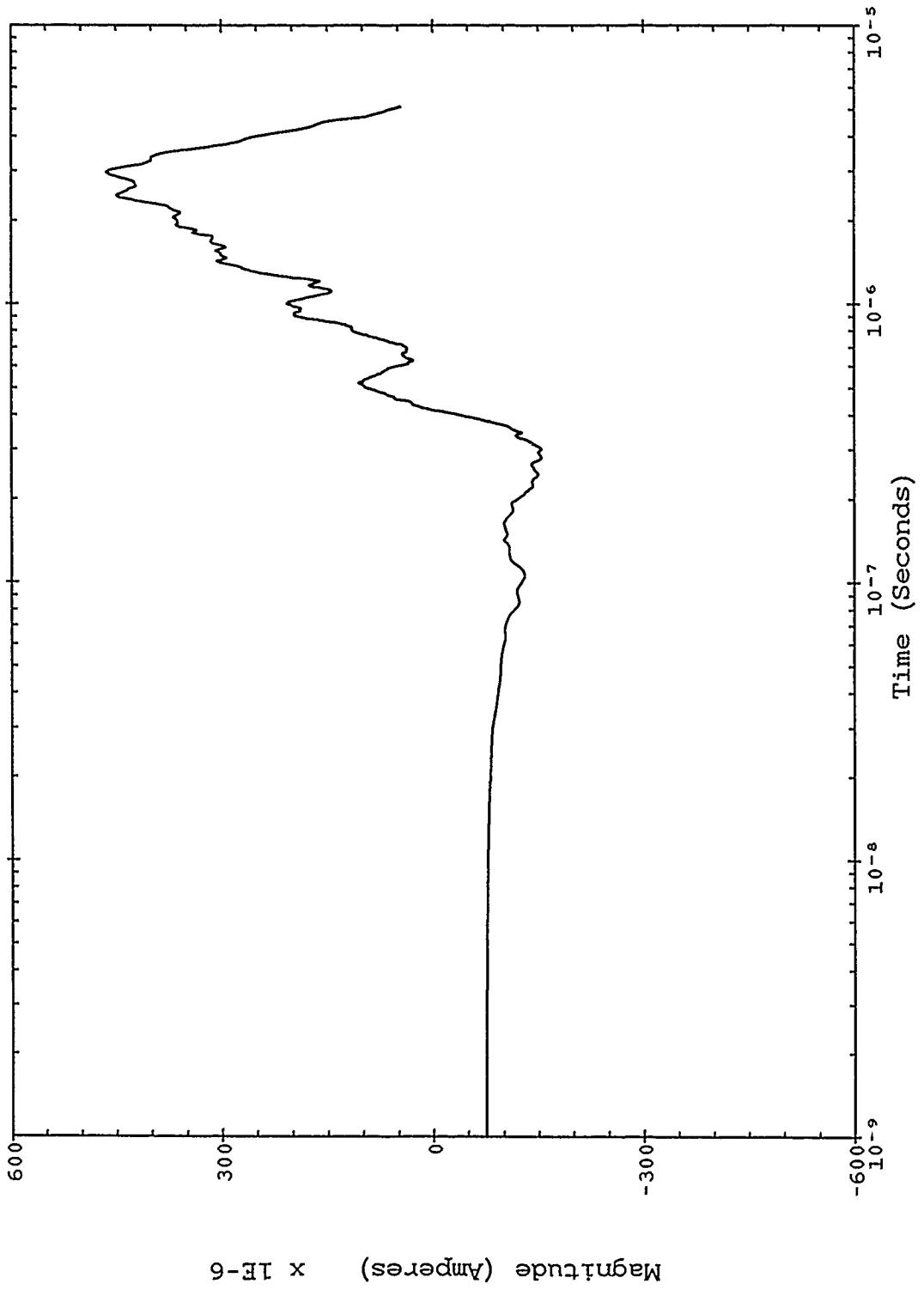


Figure B-406. Severe nearby lightning threat; TP 8027 SN 2594.

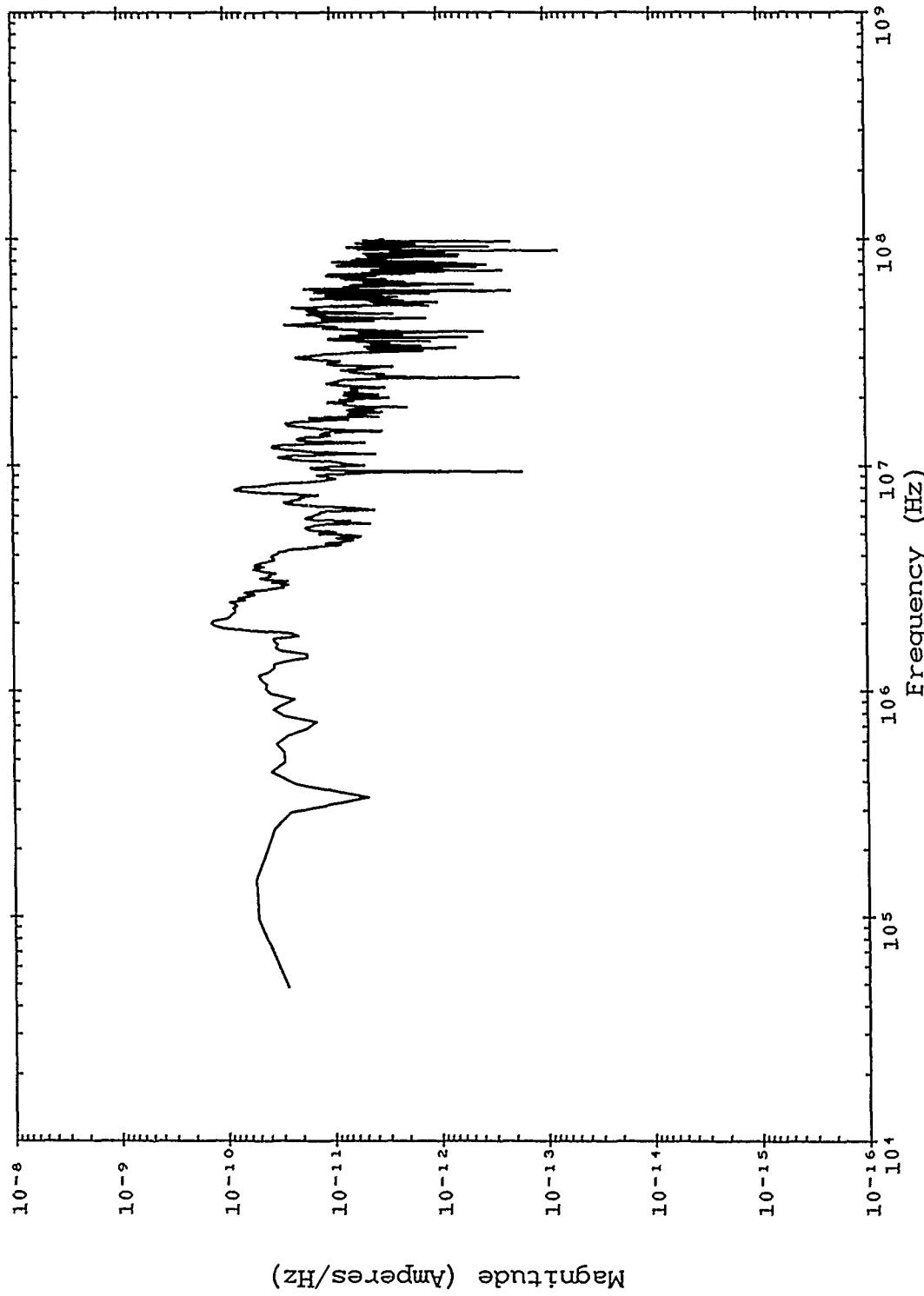


Figure B-407. Double exponential threat; TP 8027 SN 2594.

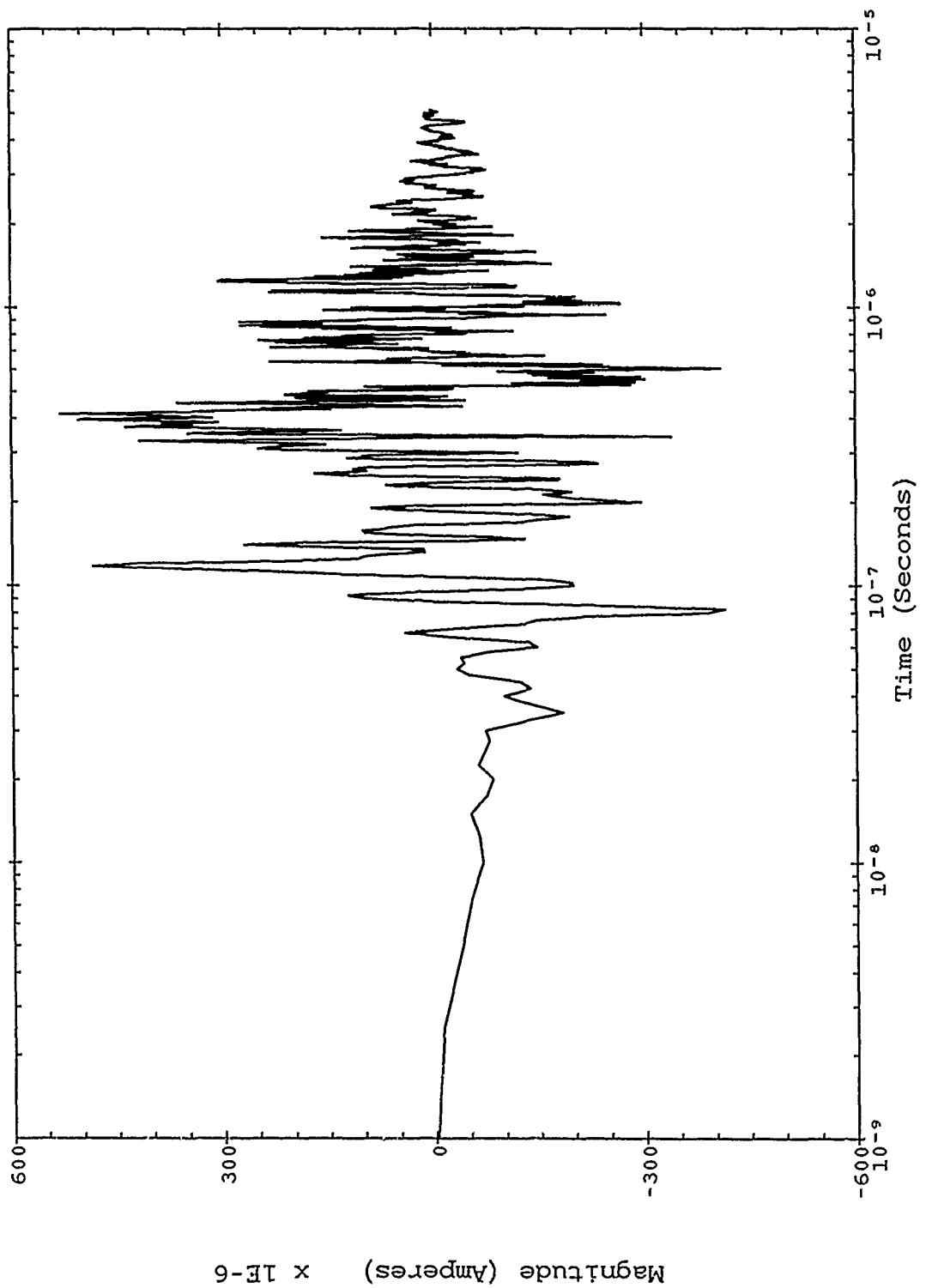


Figure B-408. Double exponential threat; TP 8027 SN 2594.

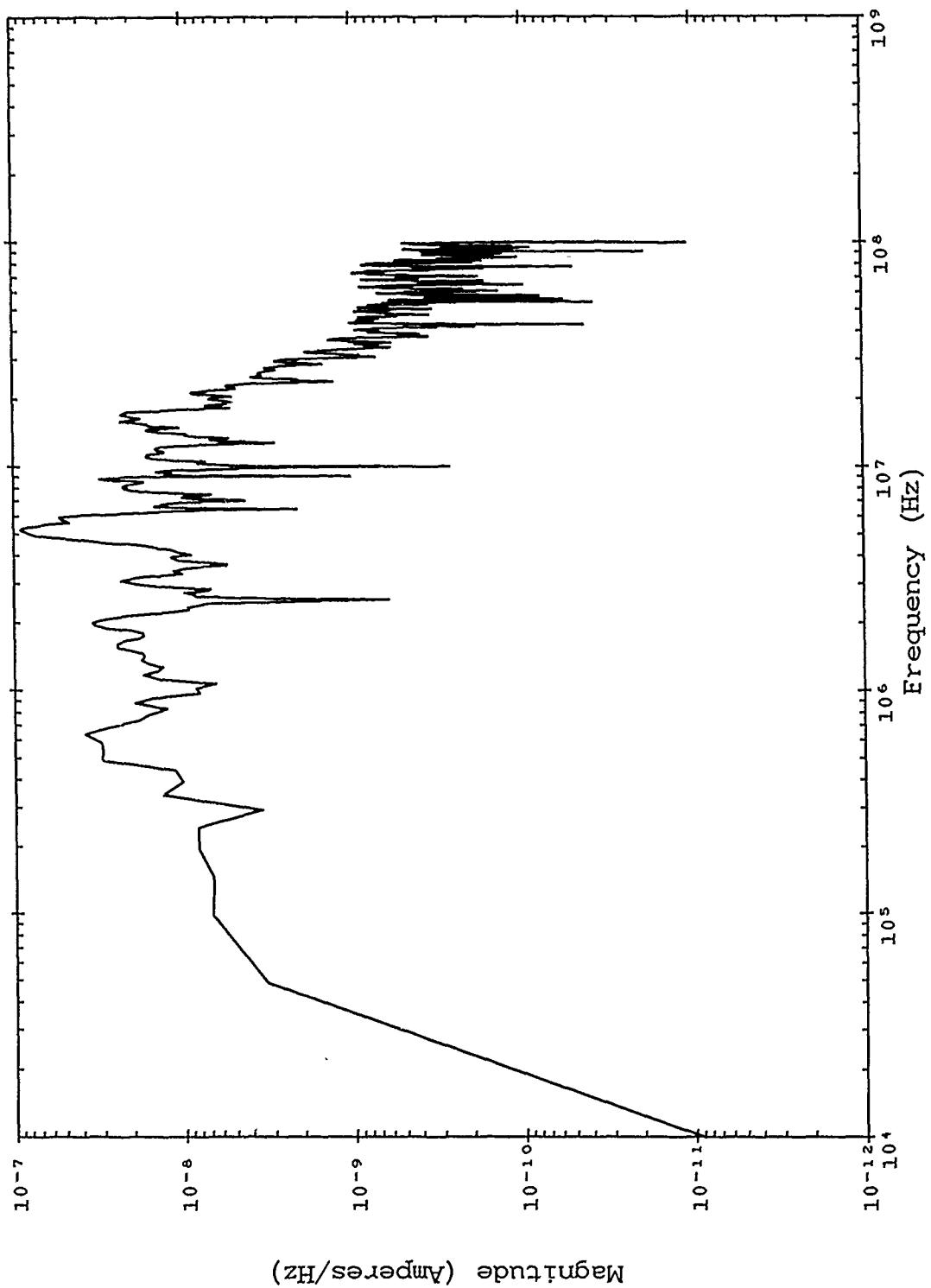


Figure B-409. Corrected TRESTLE data; TP 8075 SN 2460.

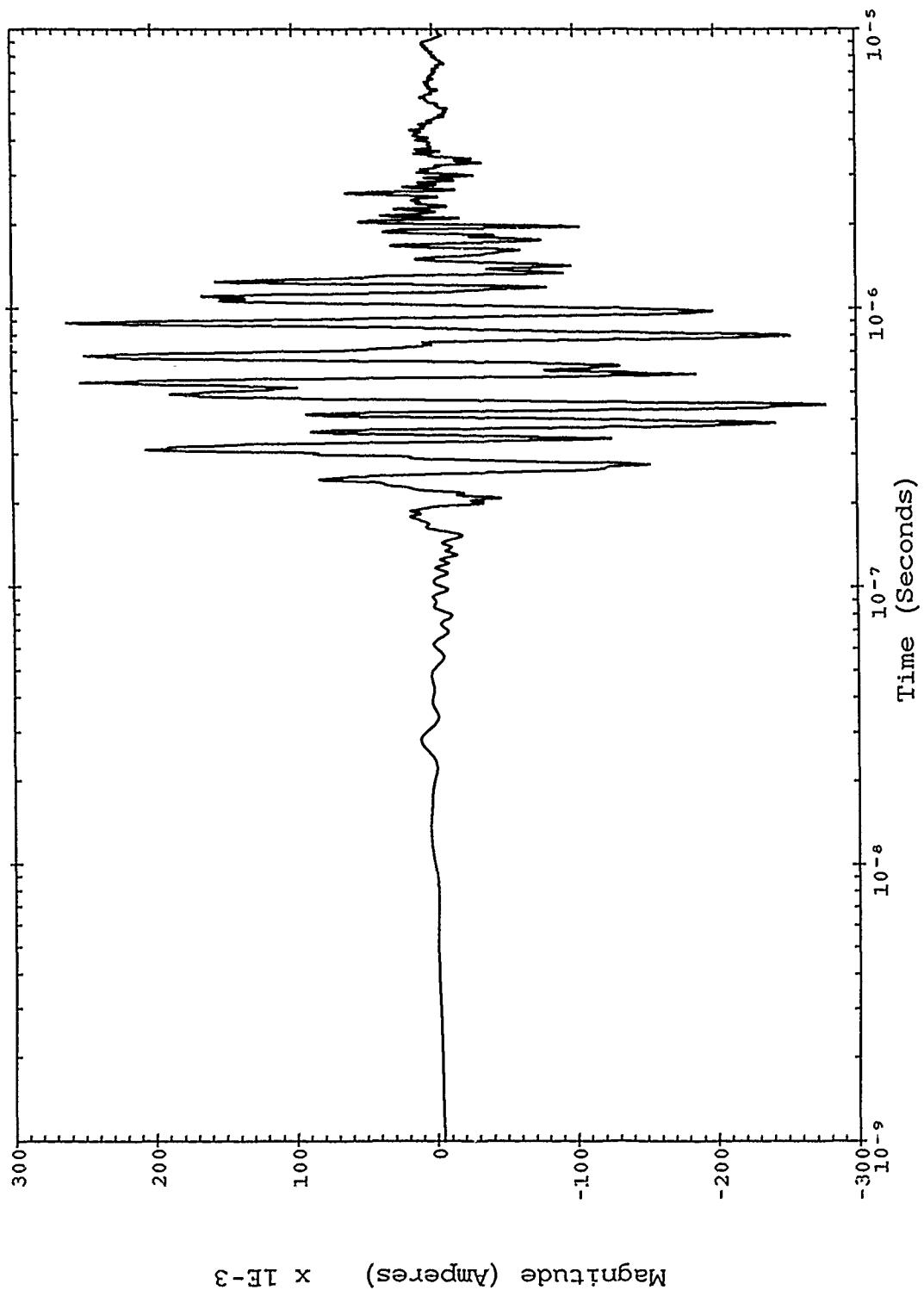


Figure B-410. Corrected TRESTLE data; TP 8075 SN 2460.

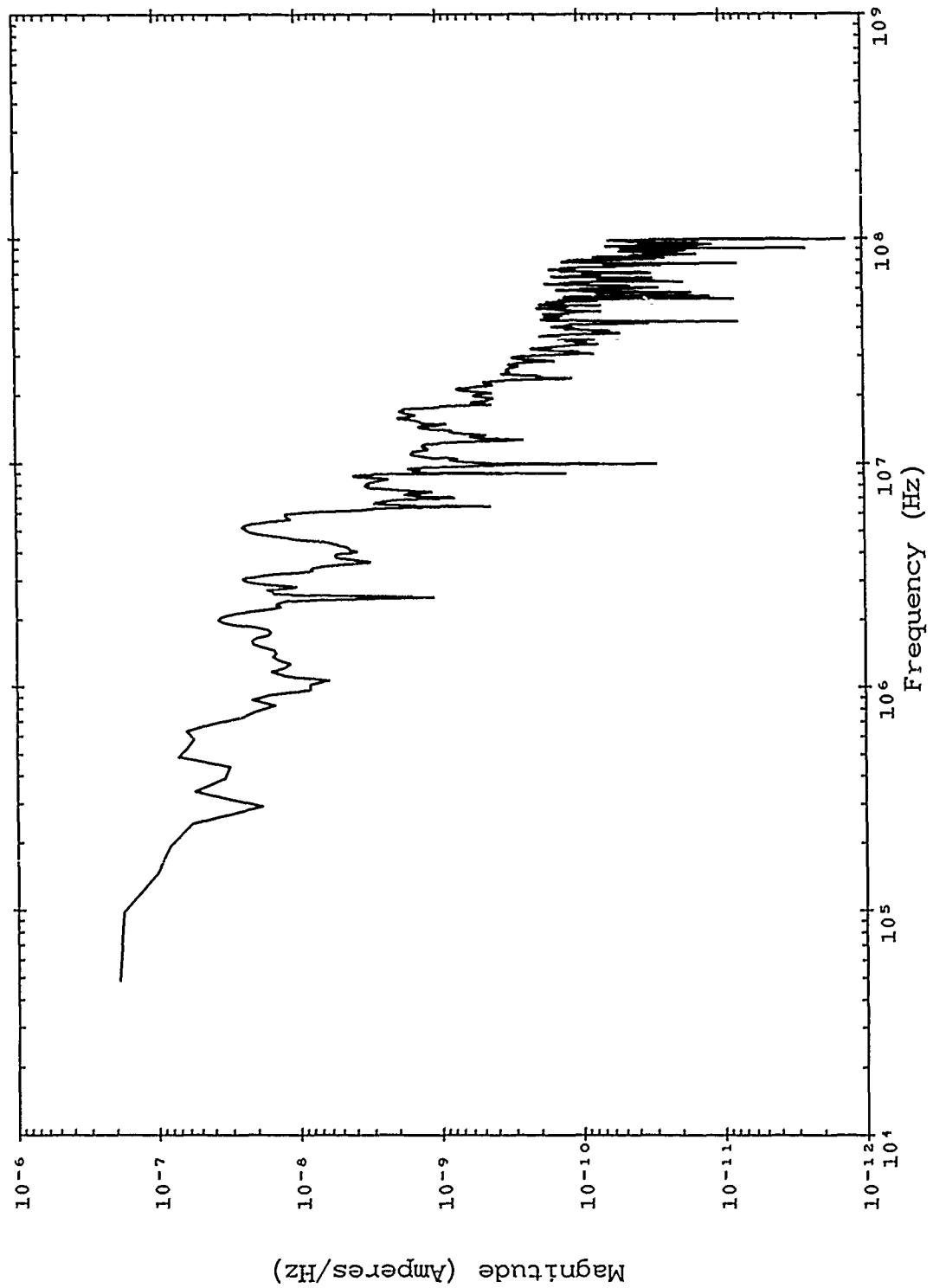


Figure B-411. Severe nearby lightning threat; TP 8075 SN 2460.

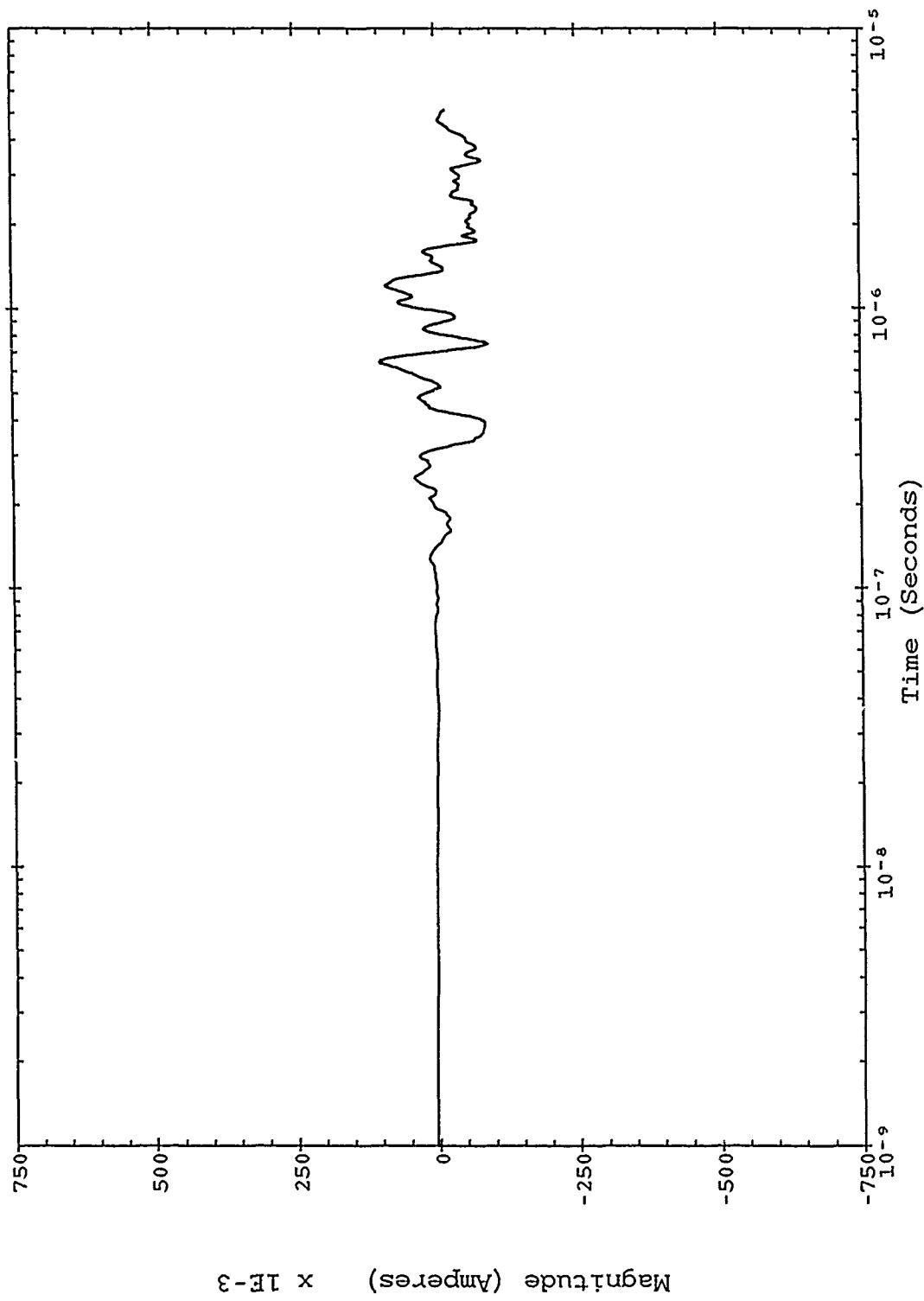


Figure B-412. Severe nearby lightning threat; TP 8075 SN 2460.

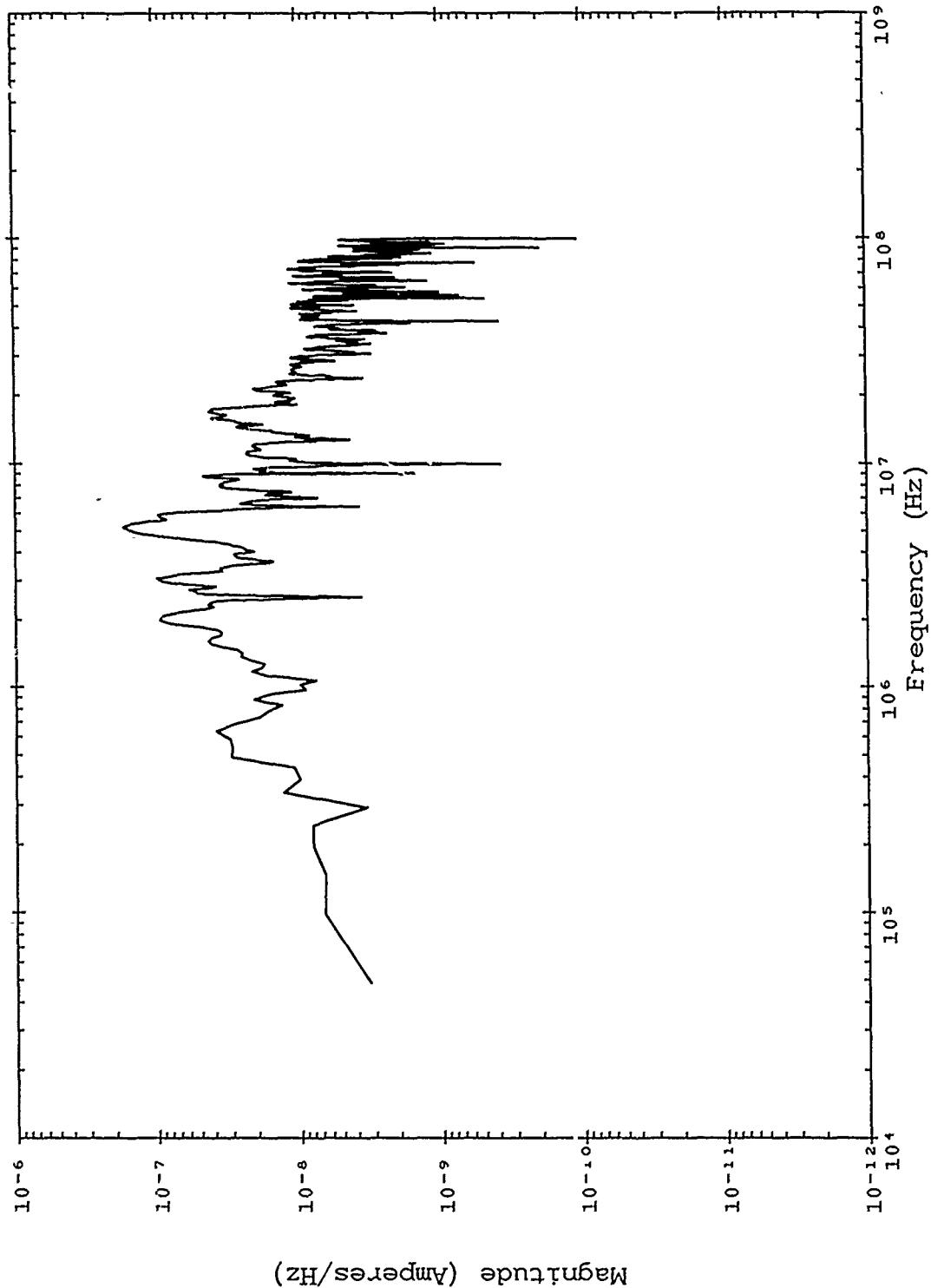


Figure B-413. Double exponential threat; TP 8075 SN 2460.

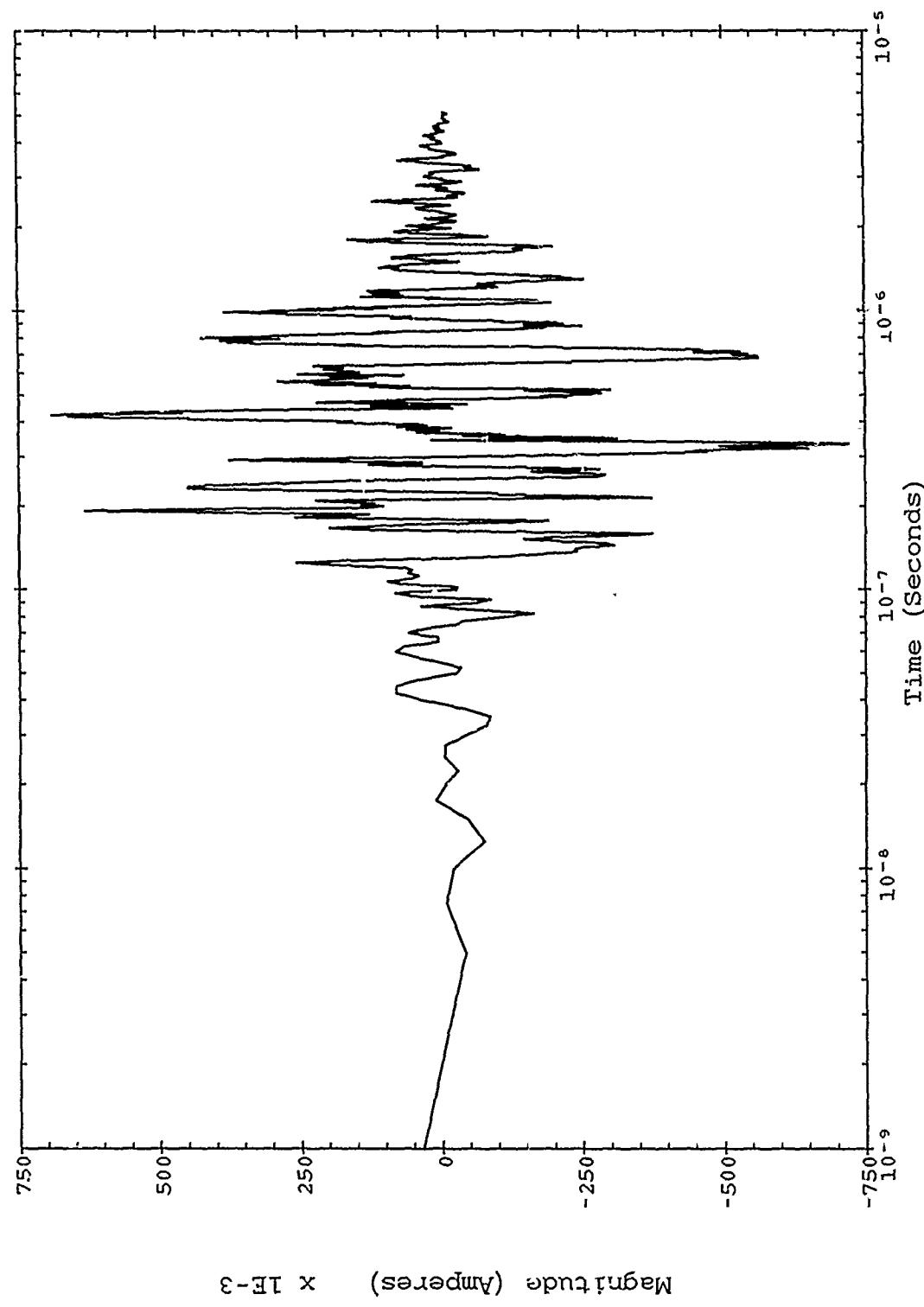


Figure B-414. Double exponential threat; TP 8075 SN 2460.

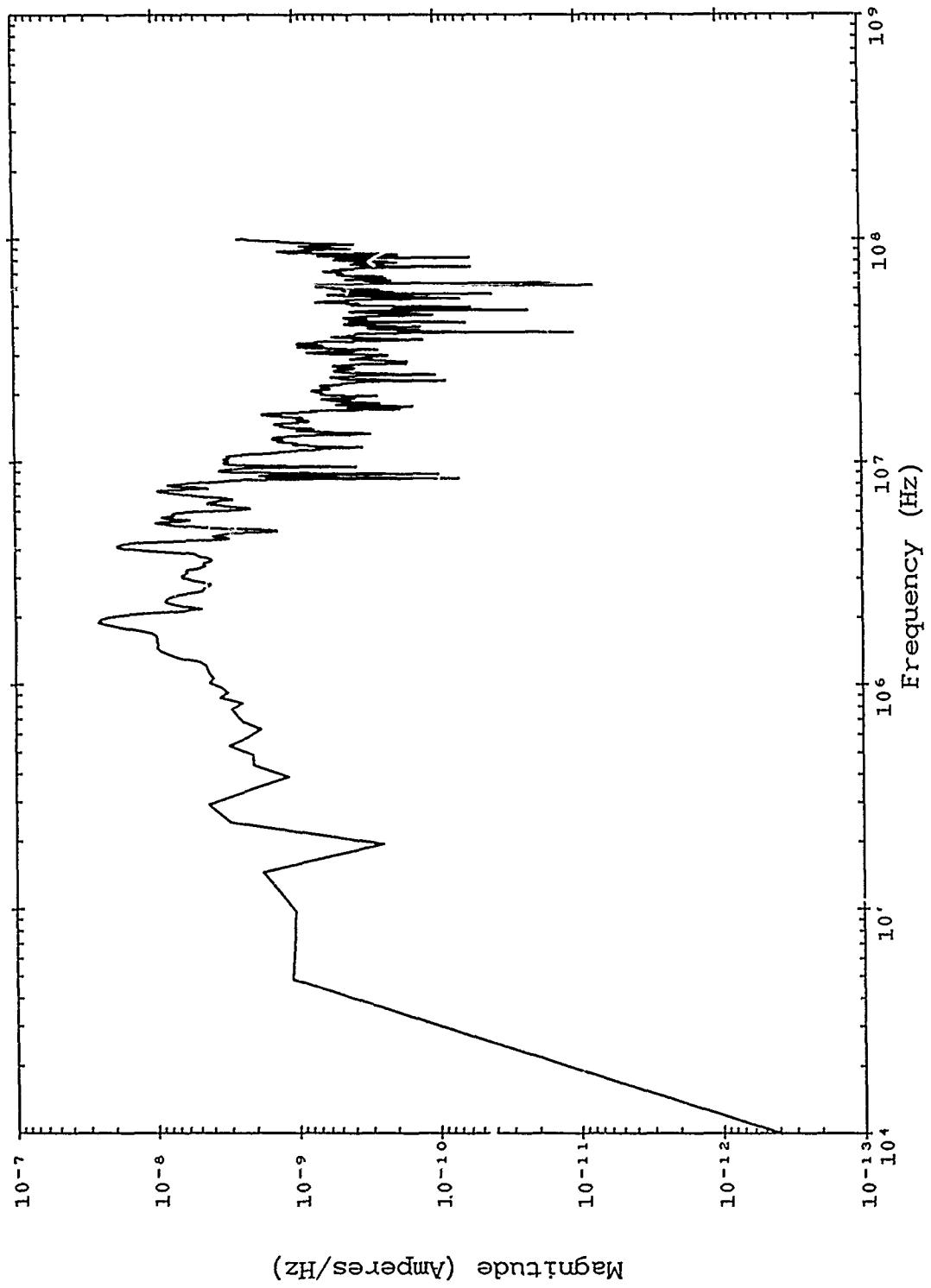


Figure B-415. Corrected TRESTLE data; TP 8524; SN 2151.

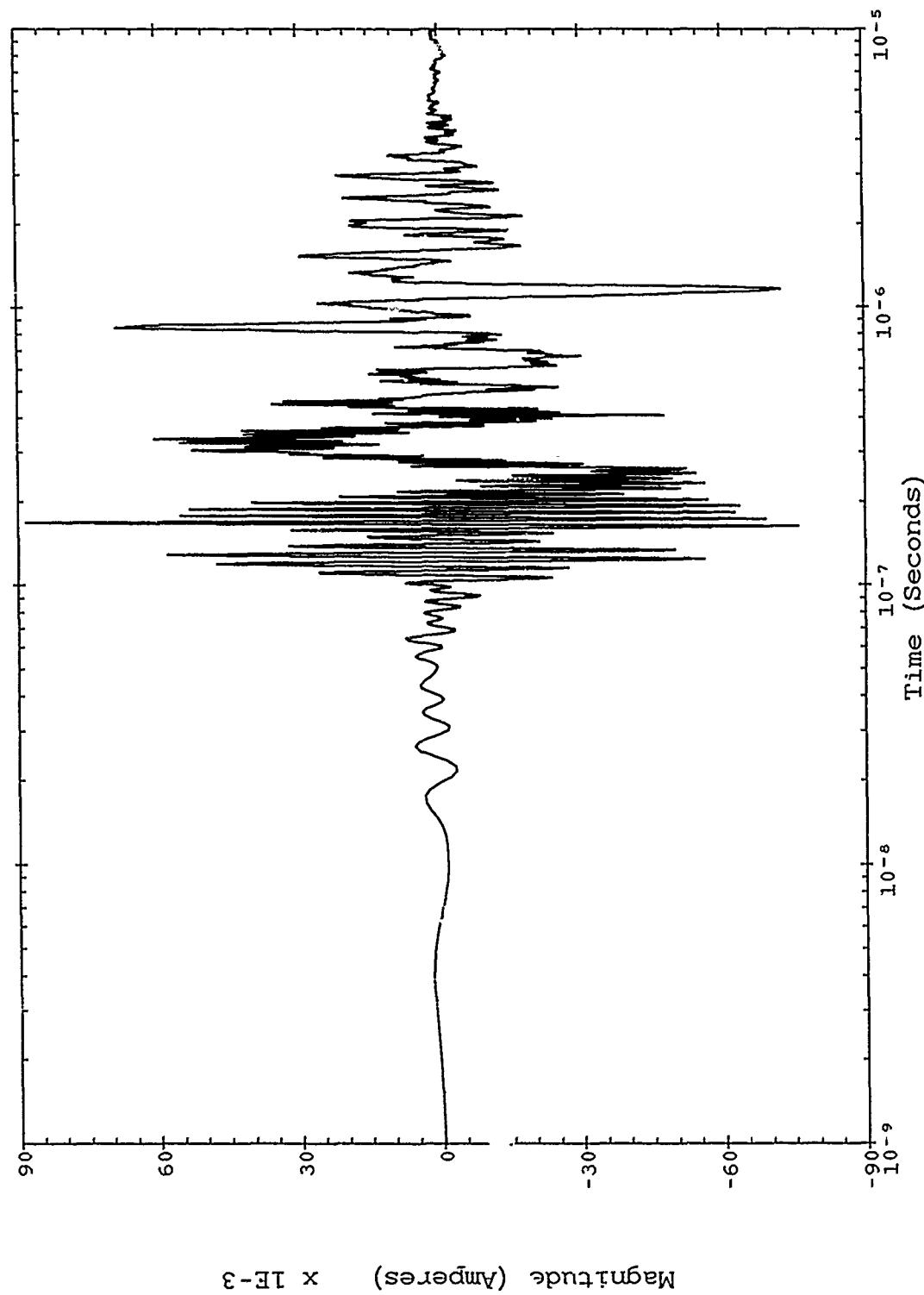


Figure B-416. Corrected TRESTLE data; TP 8524 SN 2151.

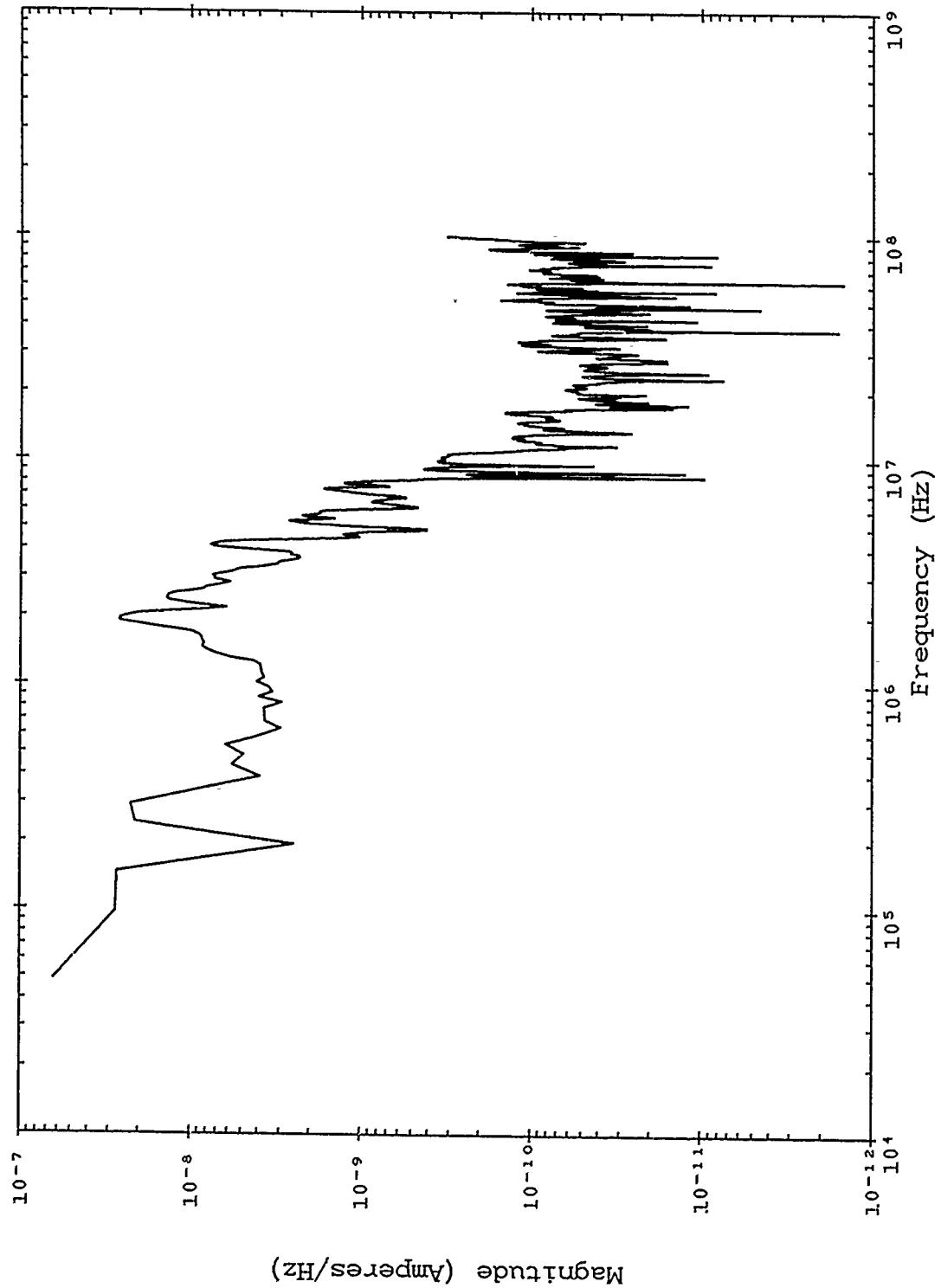


Figure B-417. Severe nearby lightning threat; TP 8524 SN 2151.

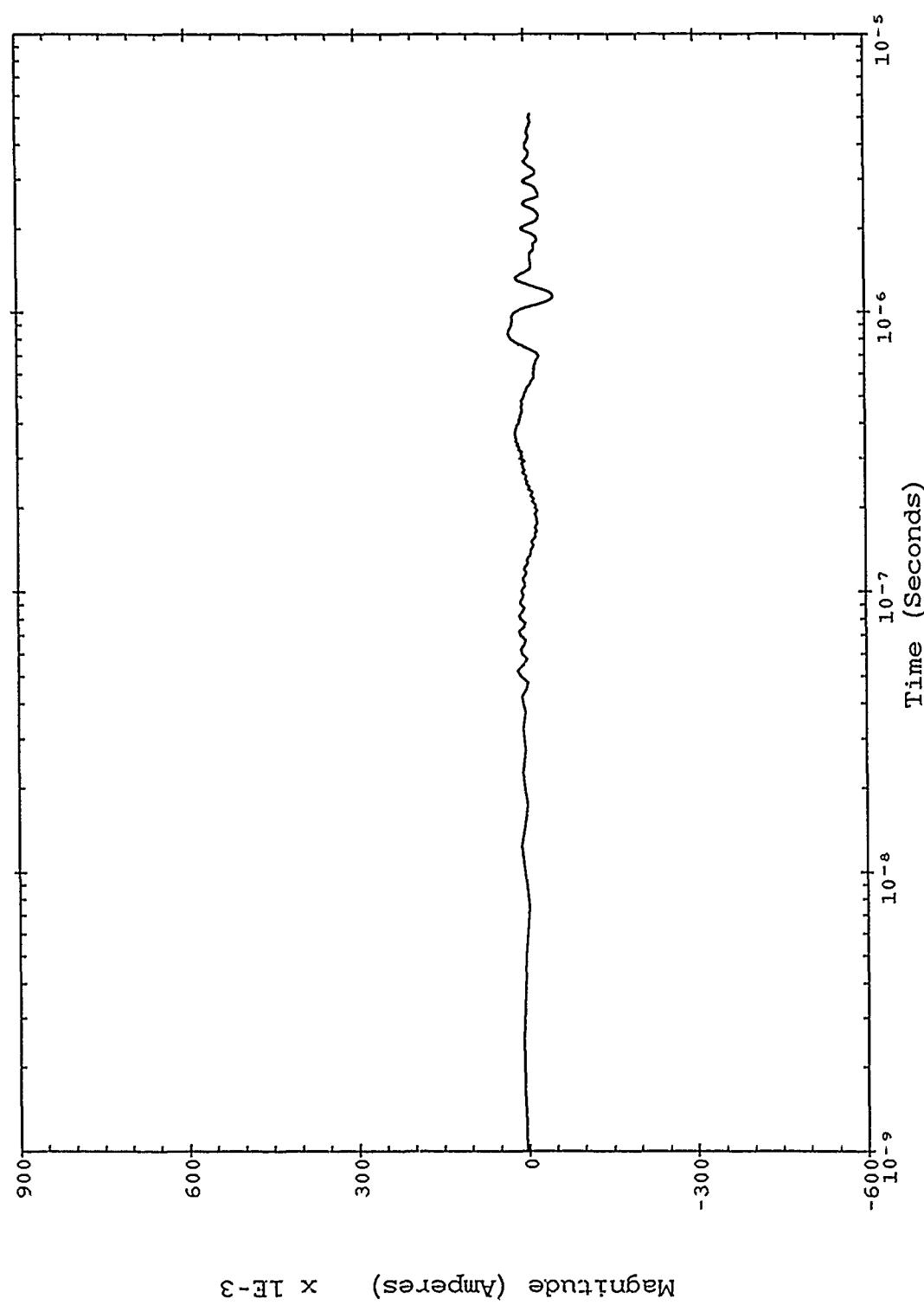


Figure B-418. Severe nearby lightning threat; TP 8524 SN 2151.

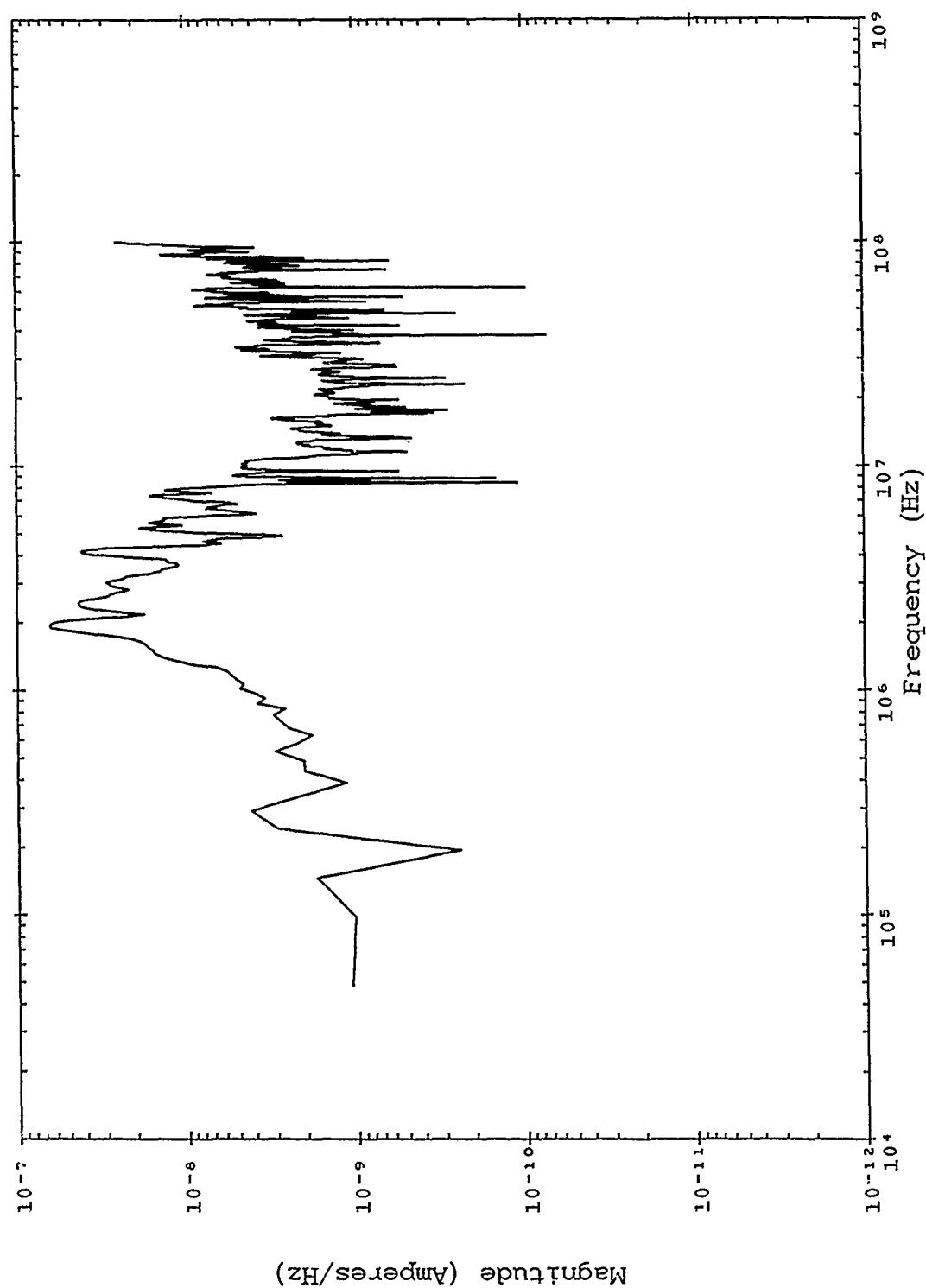


Figure B-419. Double exponential threat; TP 8524 SN 2151.

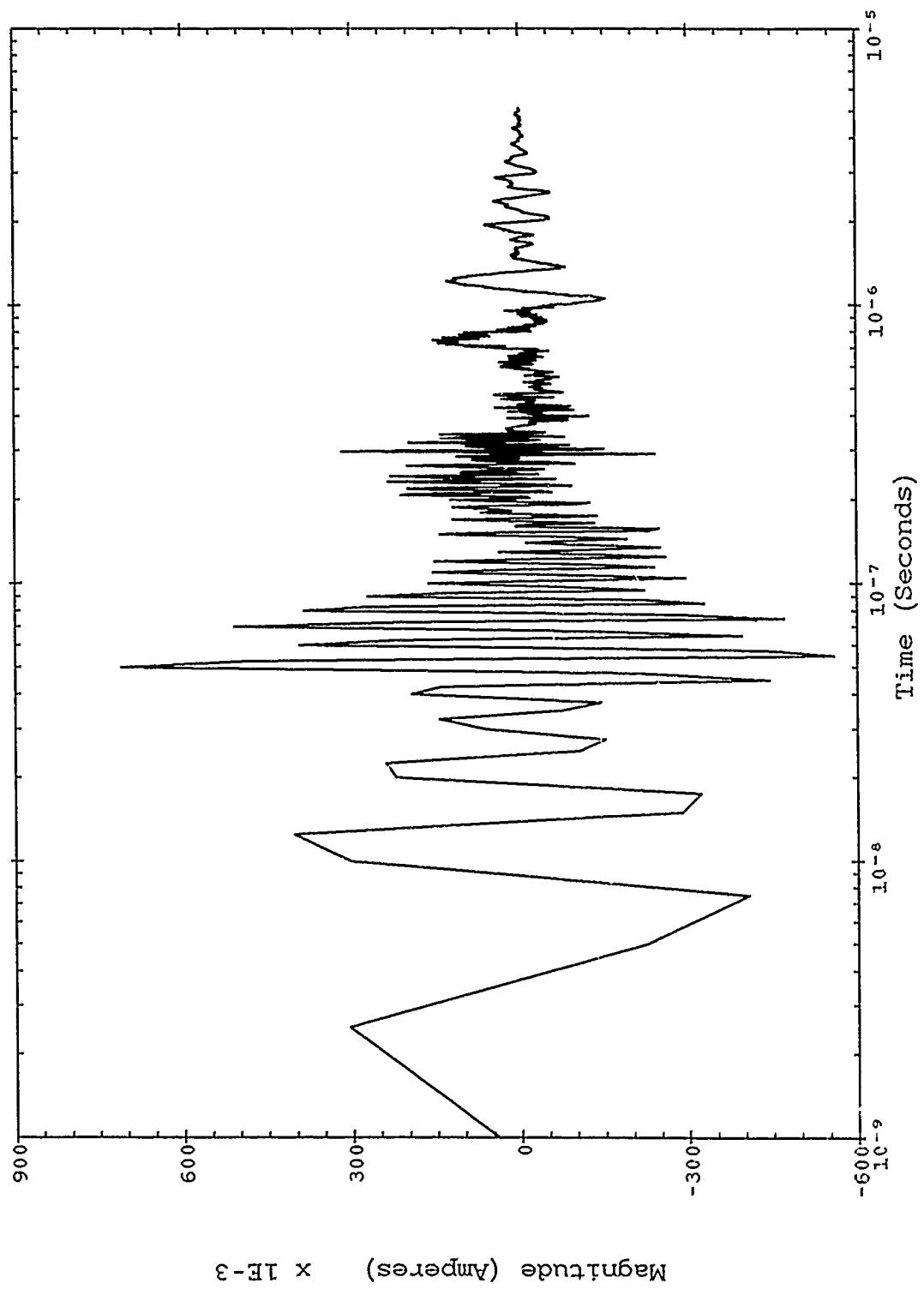


Figure B-420. Double exponential threat; TP 8524 SN 2151.

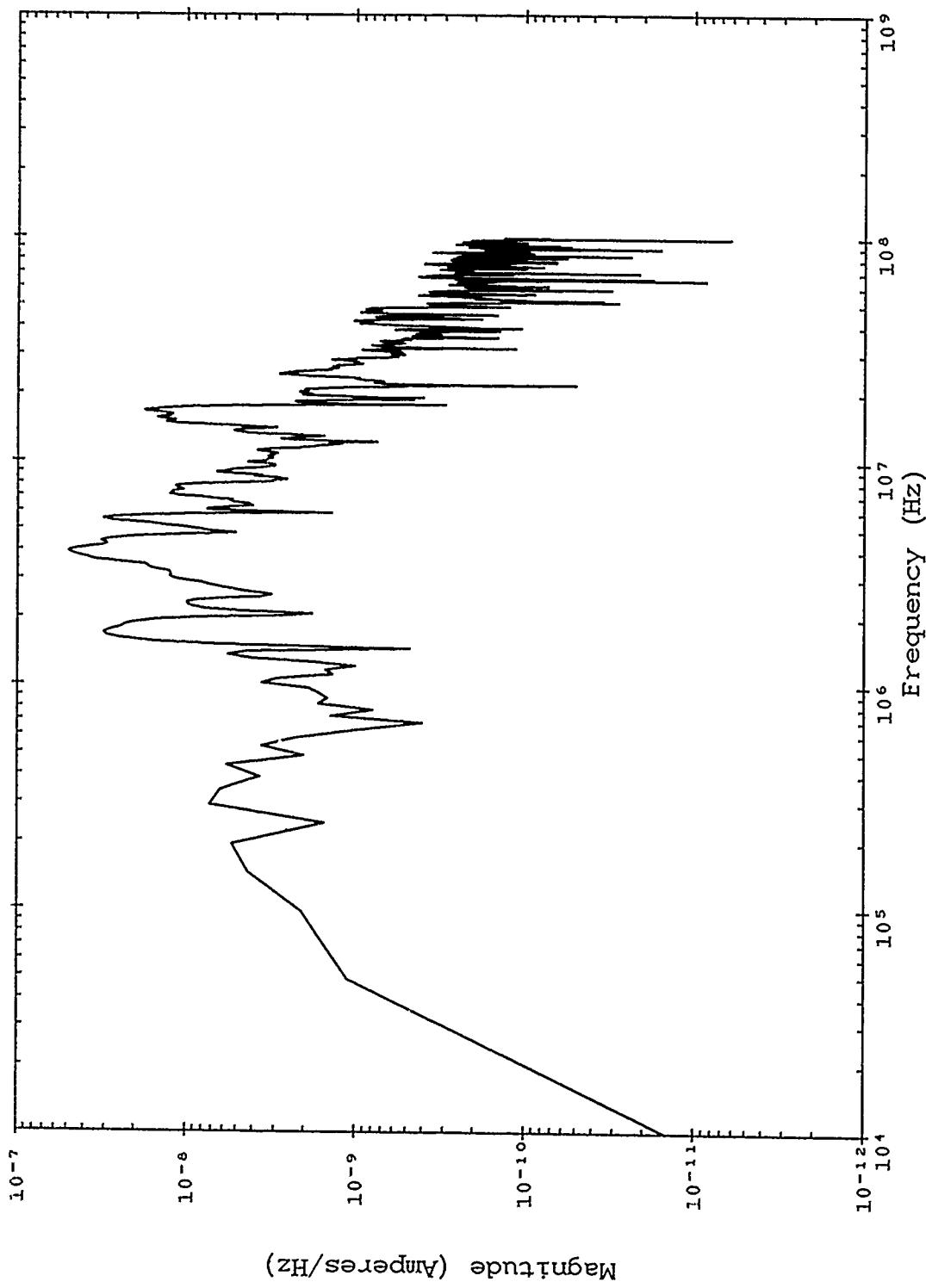


Figure B-421. Corrected TRESTLE data; TP 8681 SN 1797.

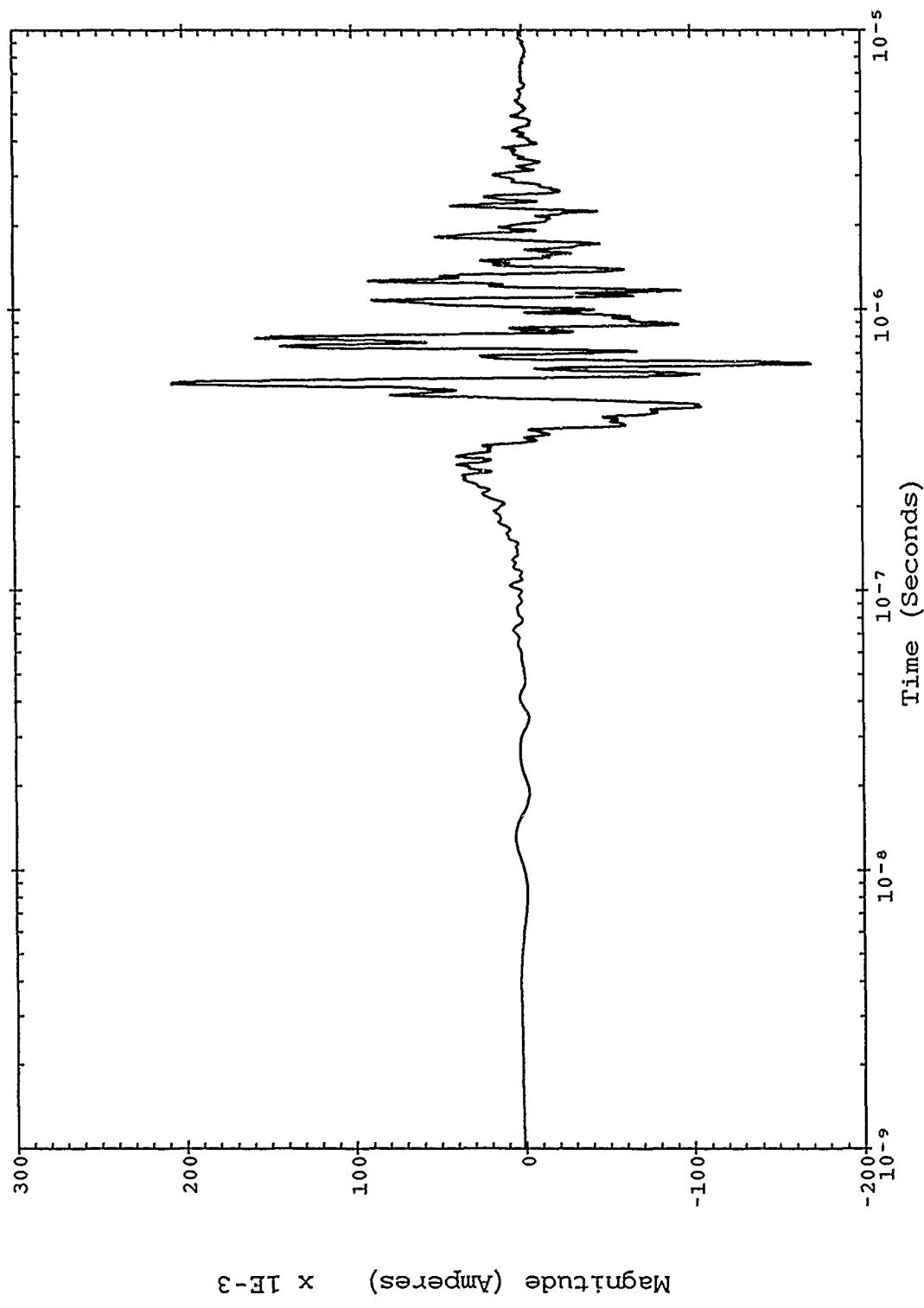


Figure B-422. Corrected TRESTLE data; TP 8681 SN 1797.

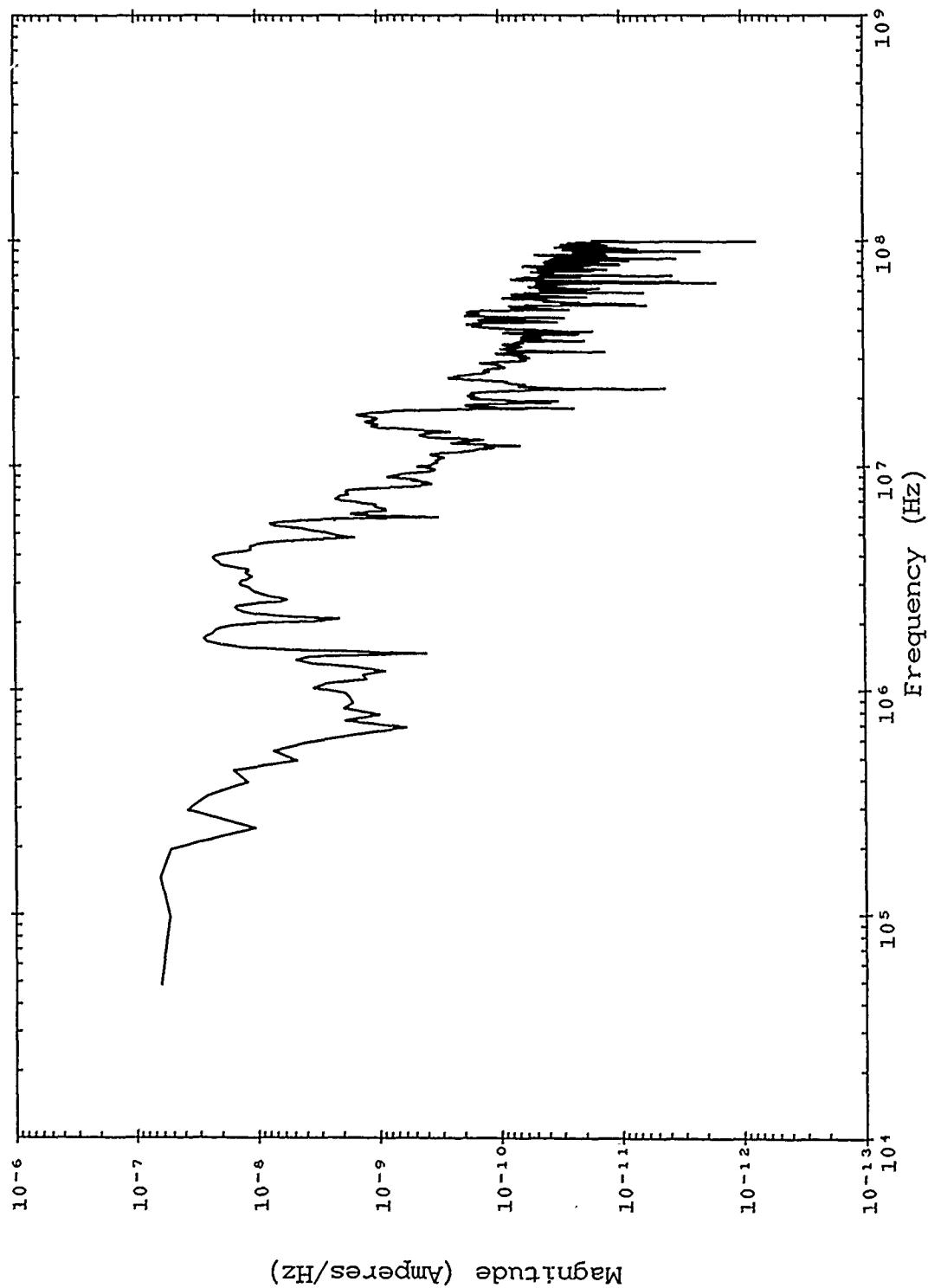


Figure B-423. Severe nearby lightning threat; TP 8681 SN 1797.

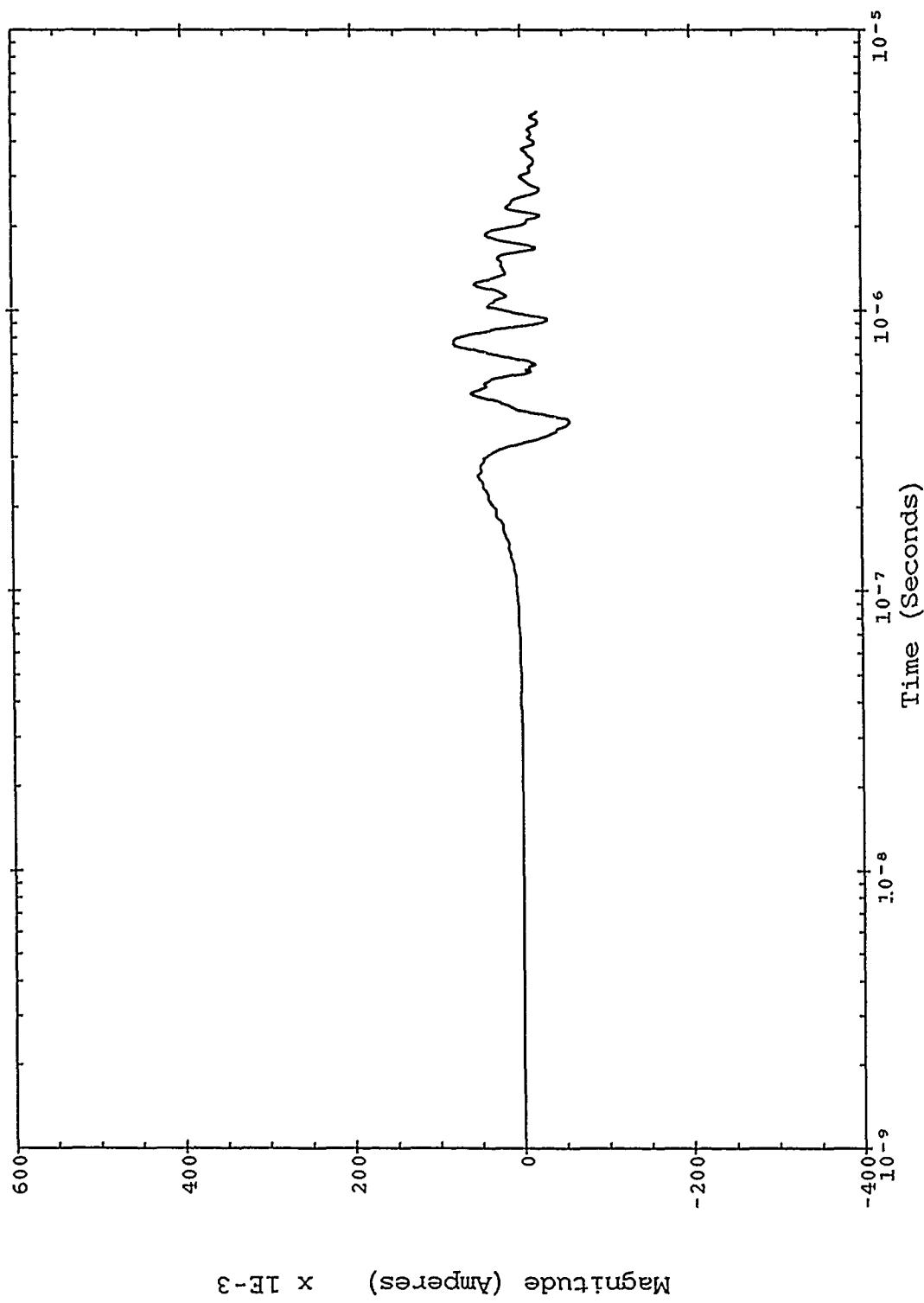


Figure B-424. Severe nearby lightning threat; TP 8681 SN 1797.

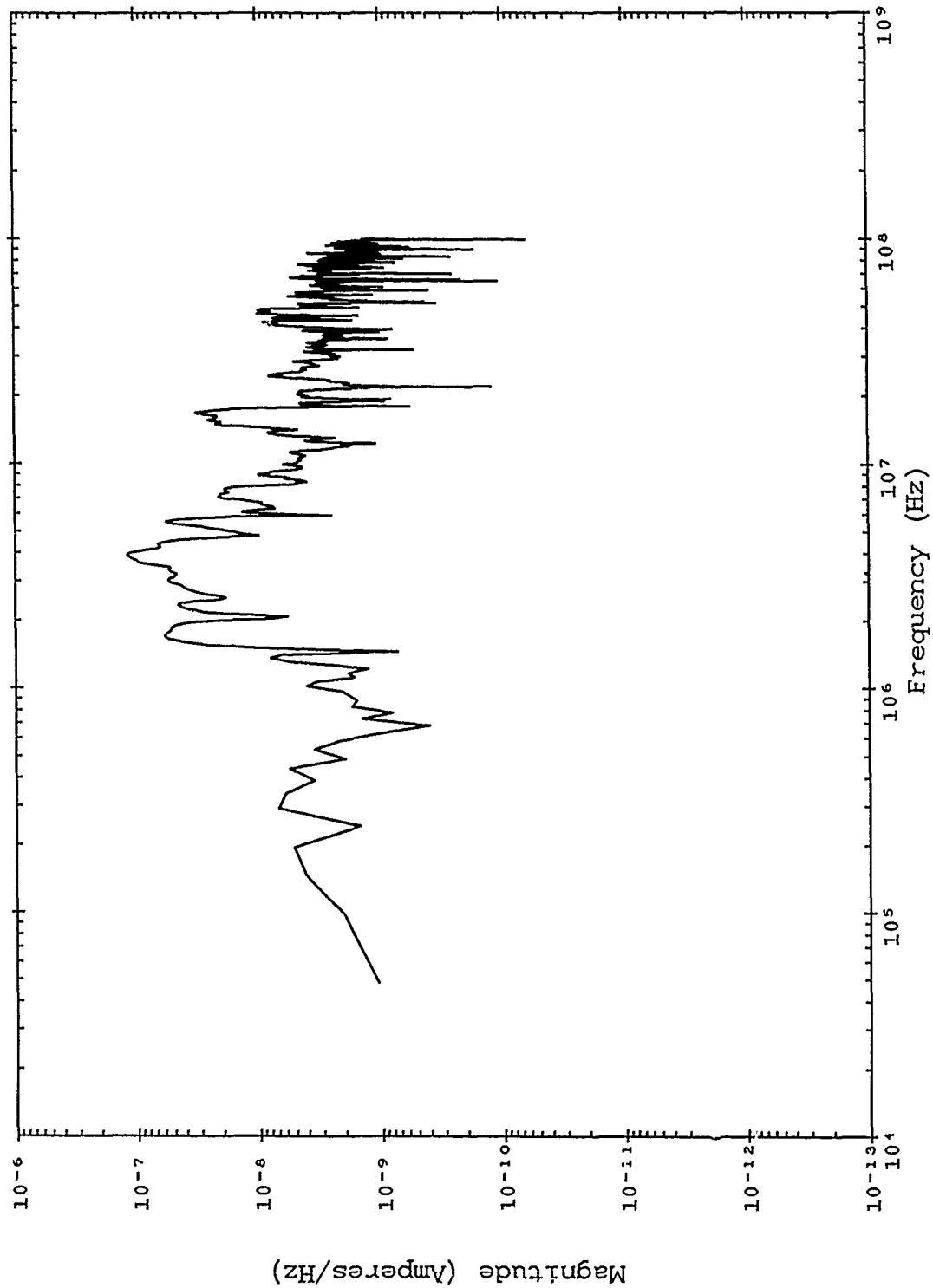


Figure B-425. Double exponential threat; TP 8681 SN 1797.

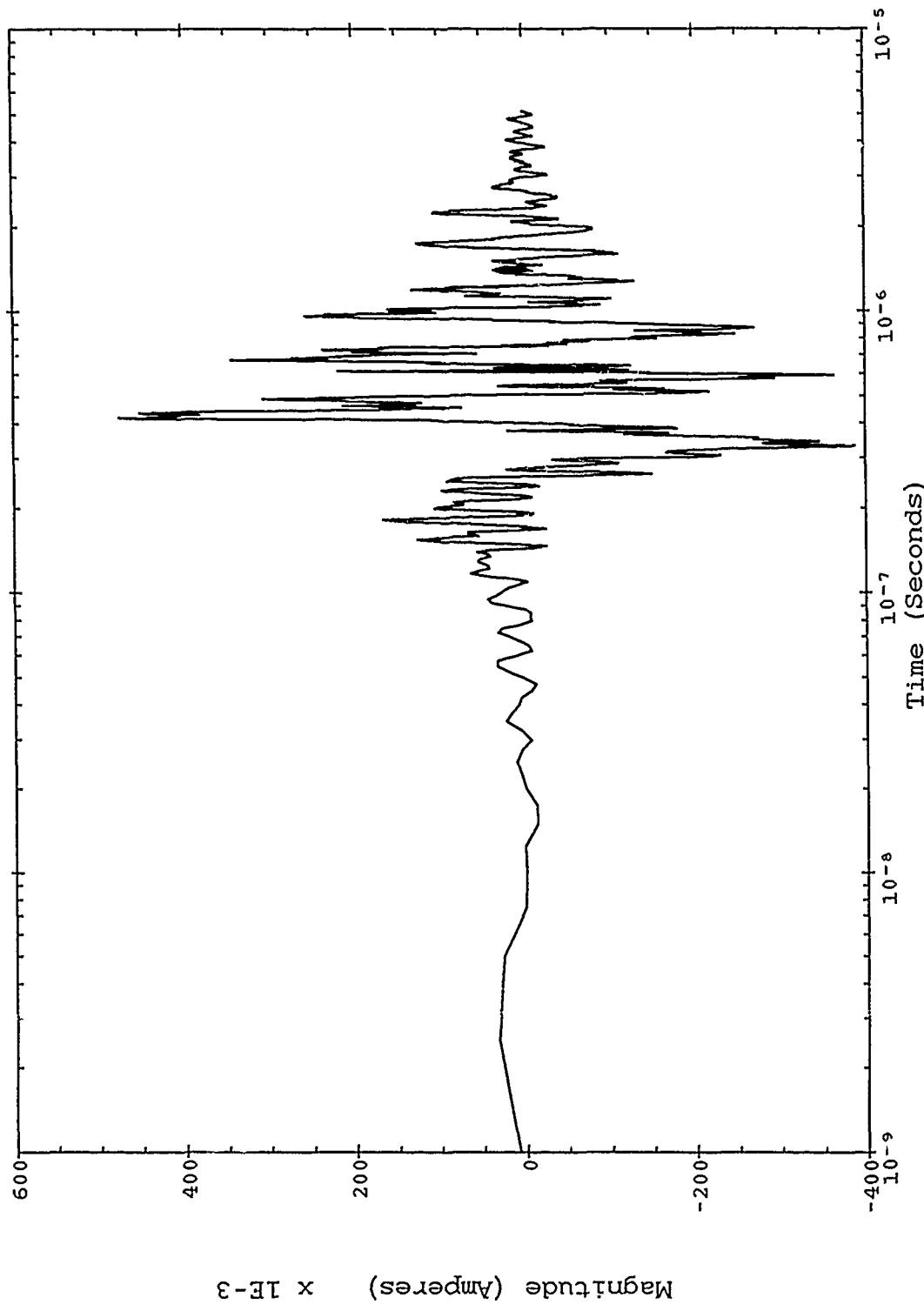


Figure B-426. Double exponential threat; TP 8681 SN 1797.

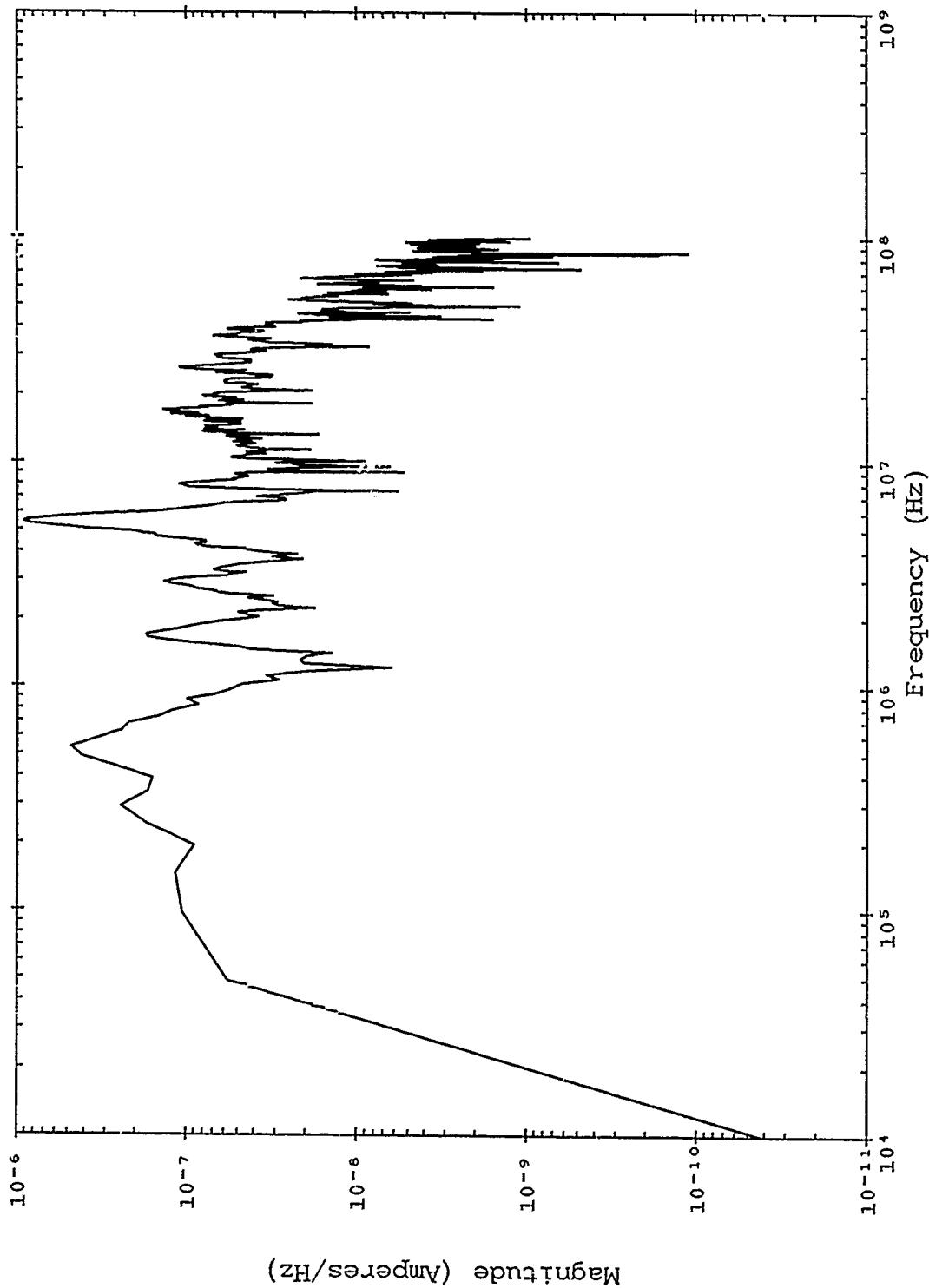


Figure B-427. Corrected TRESTLE data; IP 8695 SN 2478.

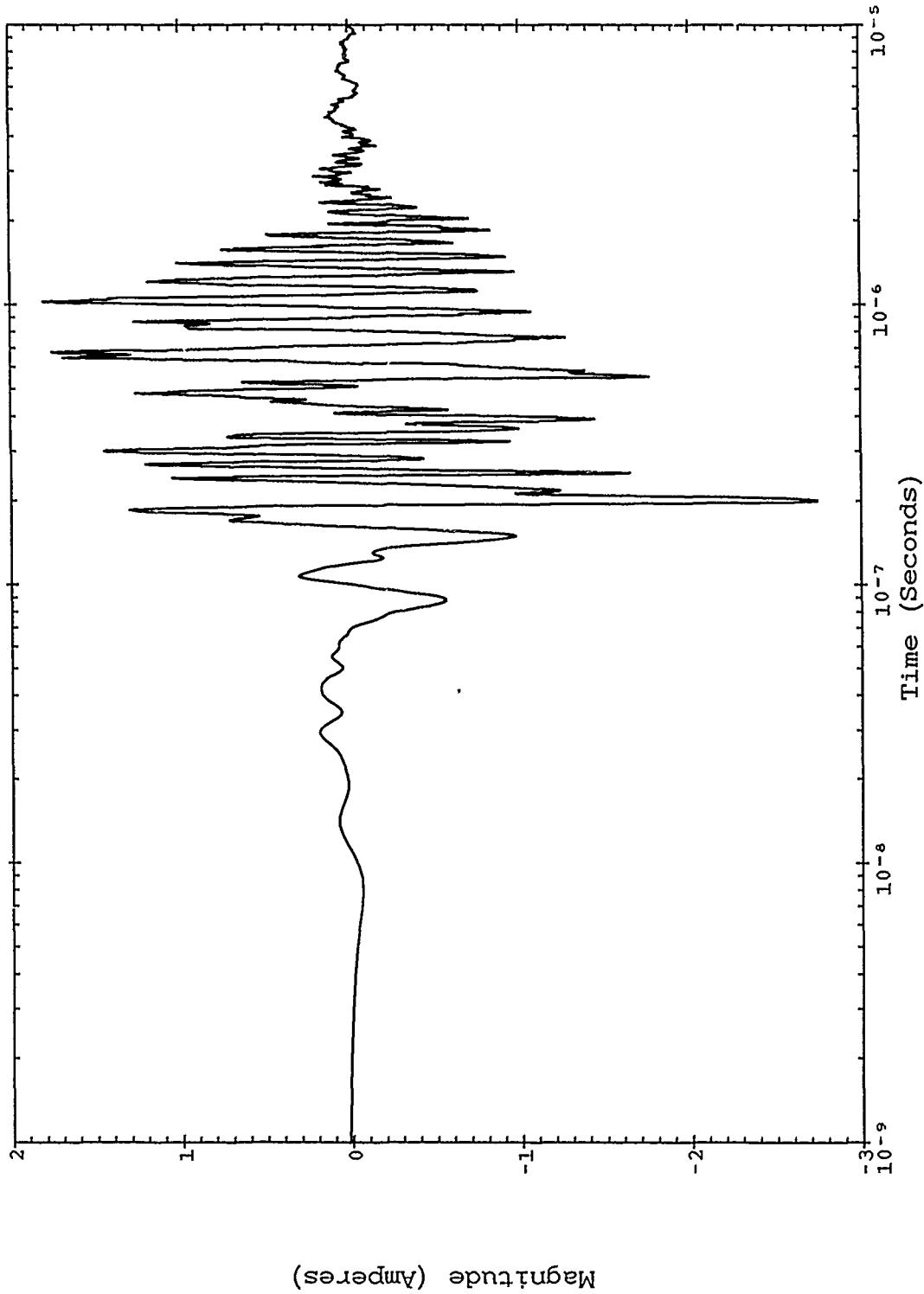


Figure B-428. Corrected TRESTLE data; TP 8695 SN 2478.

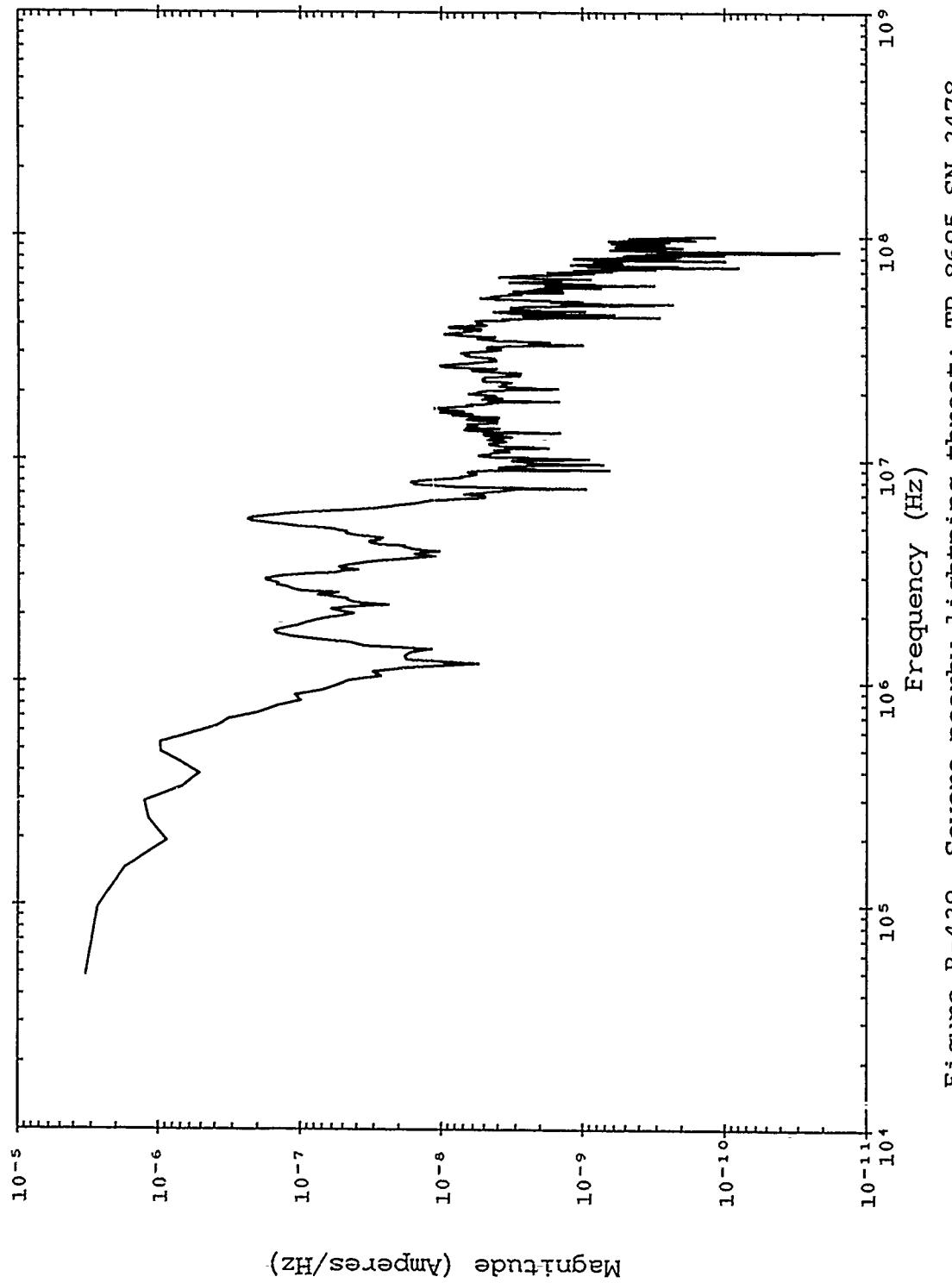


Figure B-429. Severe nearby lightning threat; TP 8695 SN 2478.

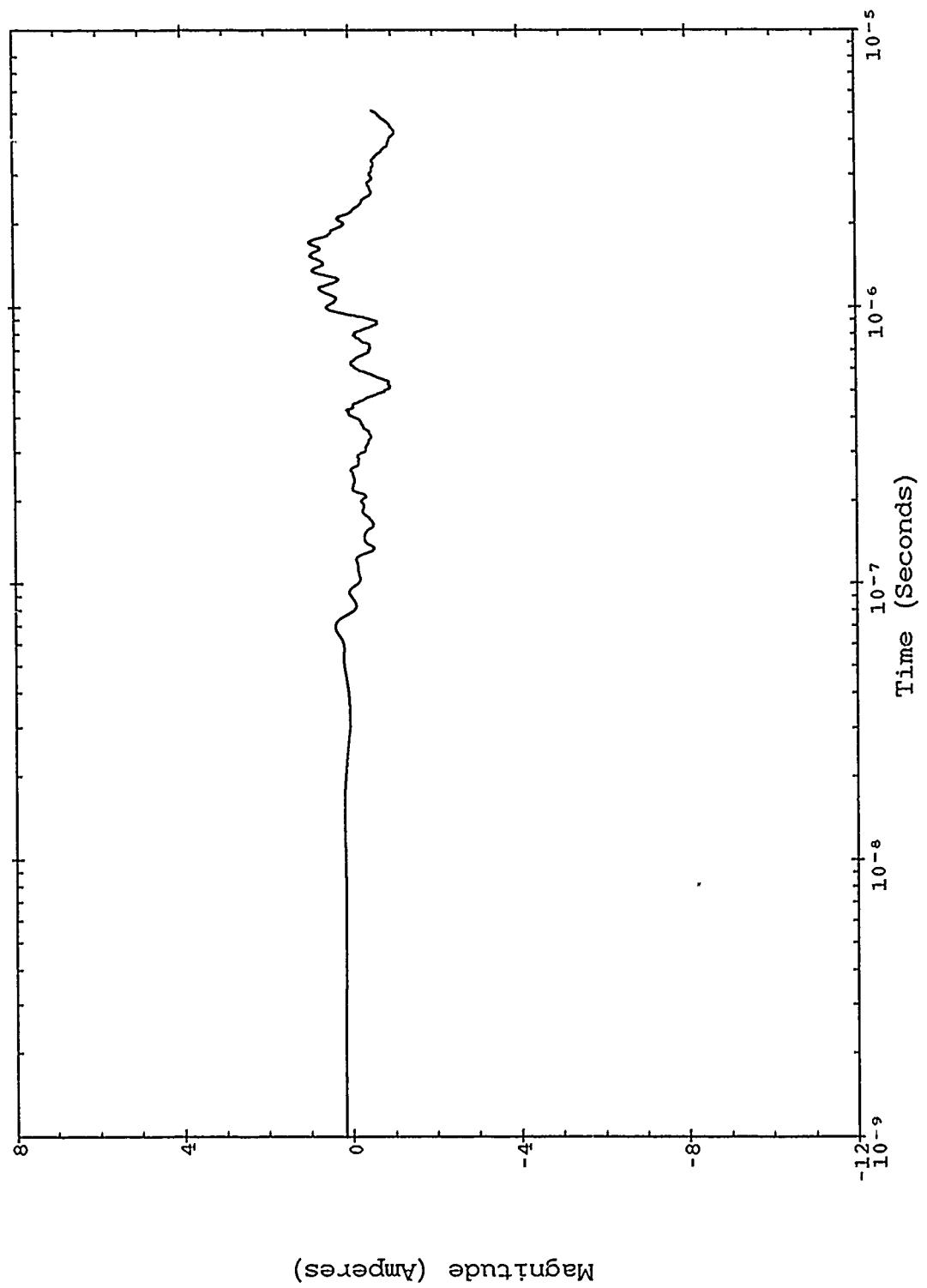


Figure B-430. Severe nearby lightning threat; TP 8695 SN 2478.

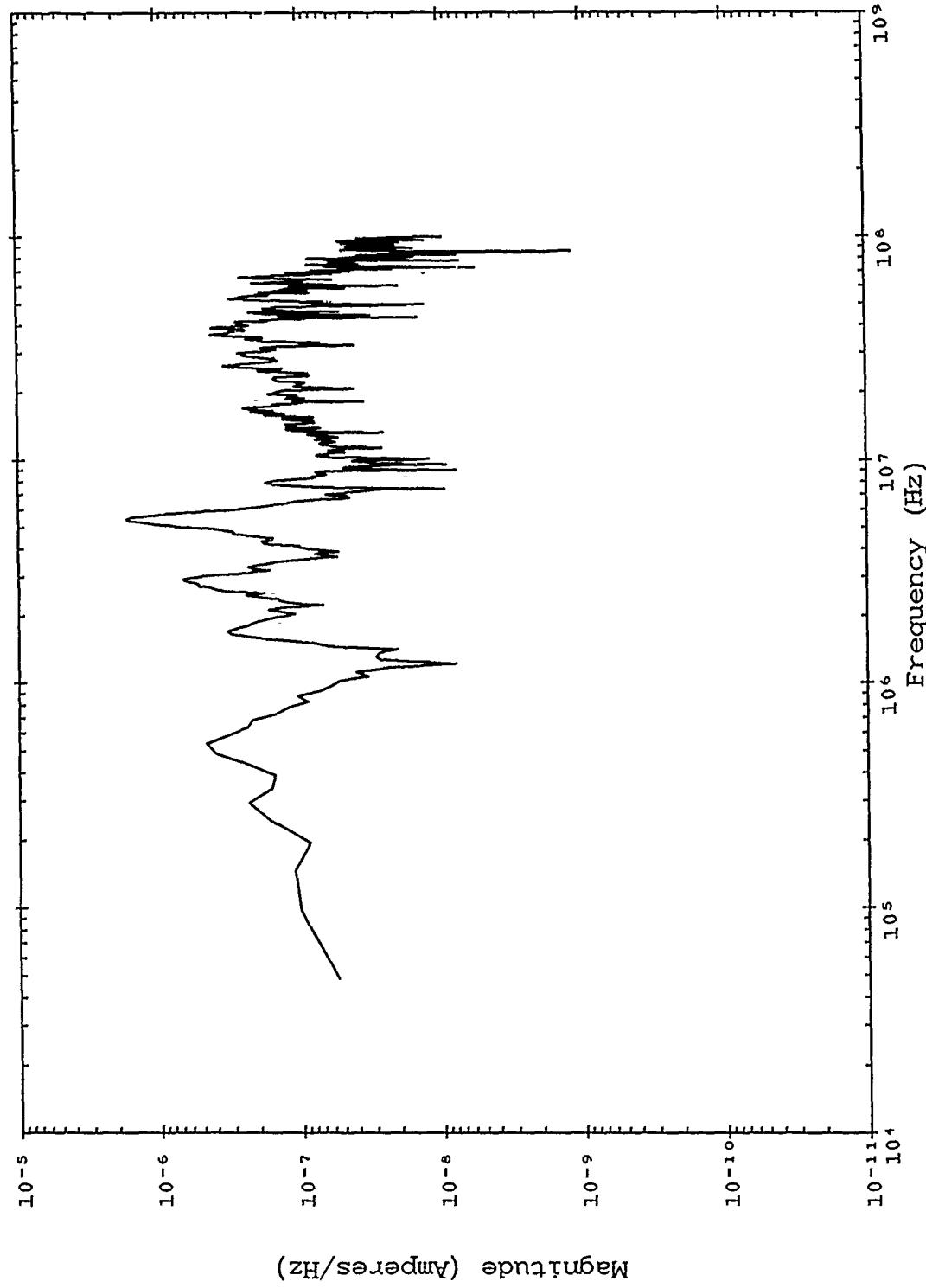


Figure B-431. Double exponential all threat; TP 8695 SN 2478.

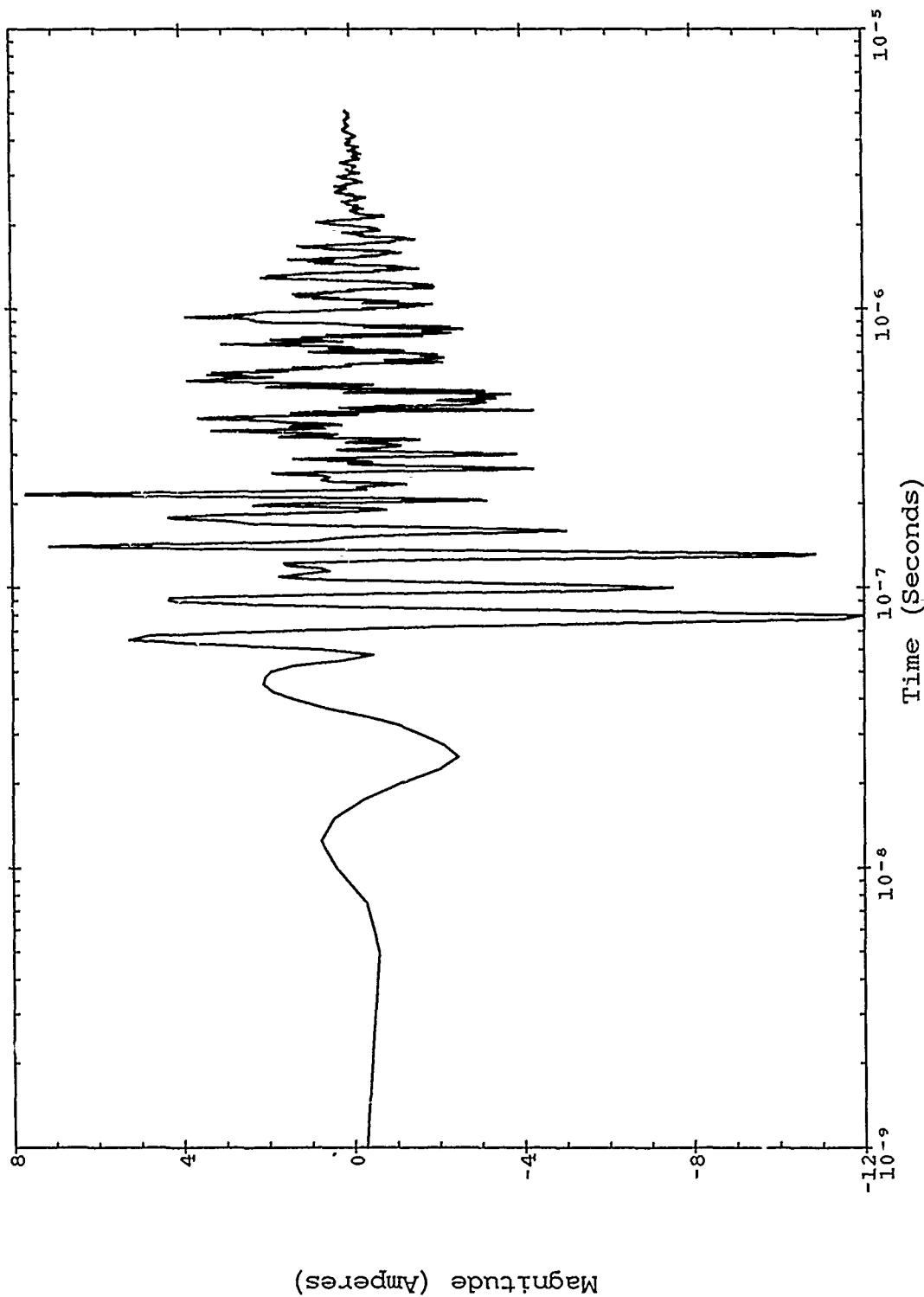


Figure B-432. Double exponential threat; TP 8695 SN 2478.

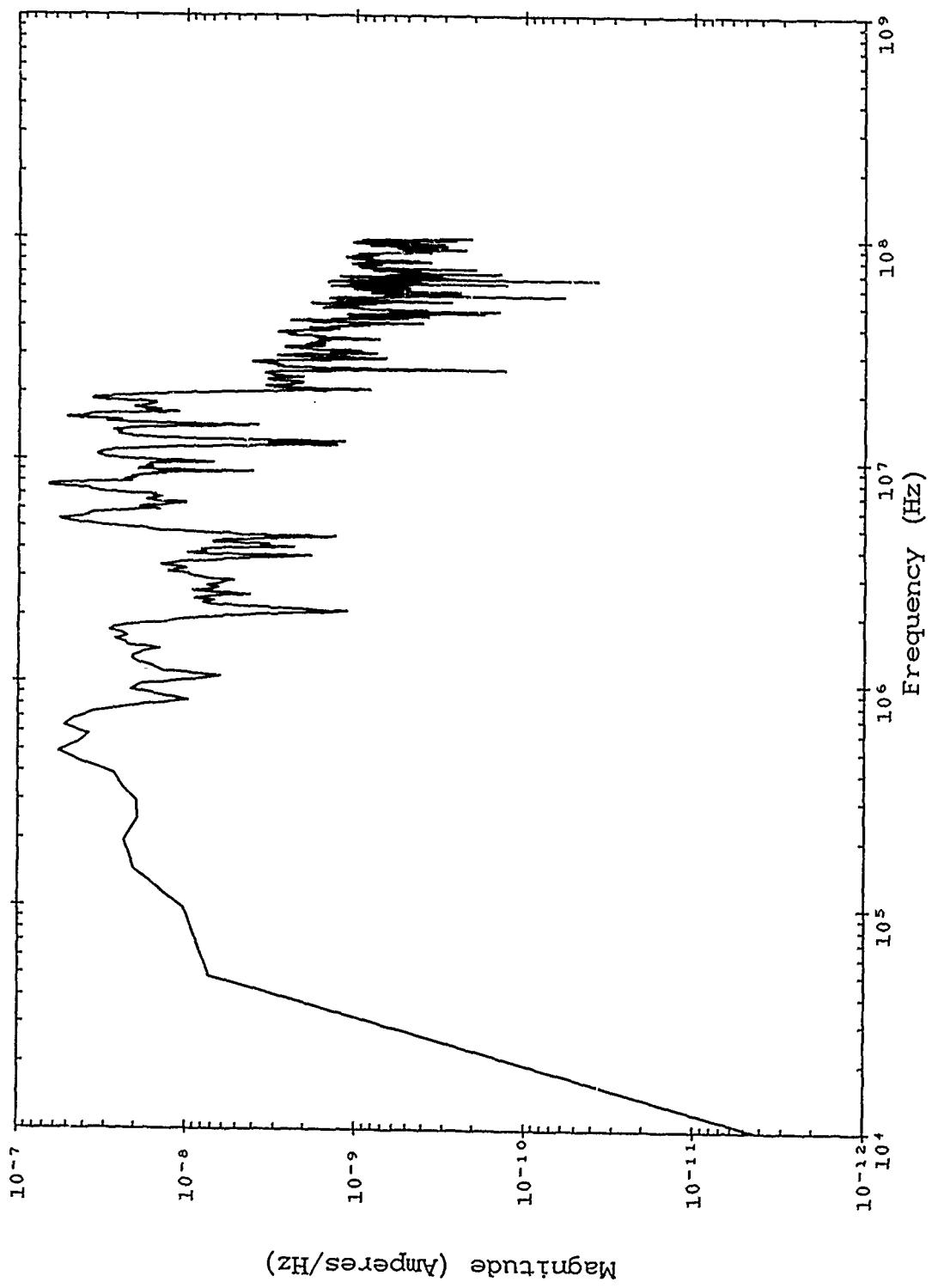


Figure B-433. Corrected TRESTLE data; TP 8806 SN 2197.

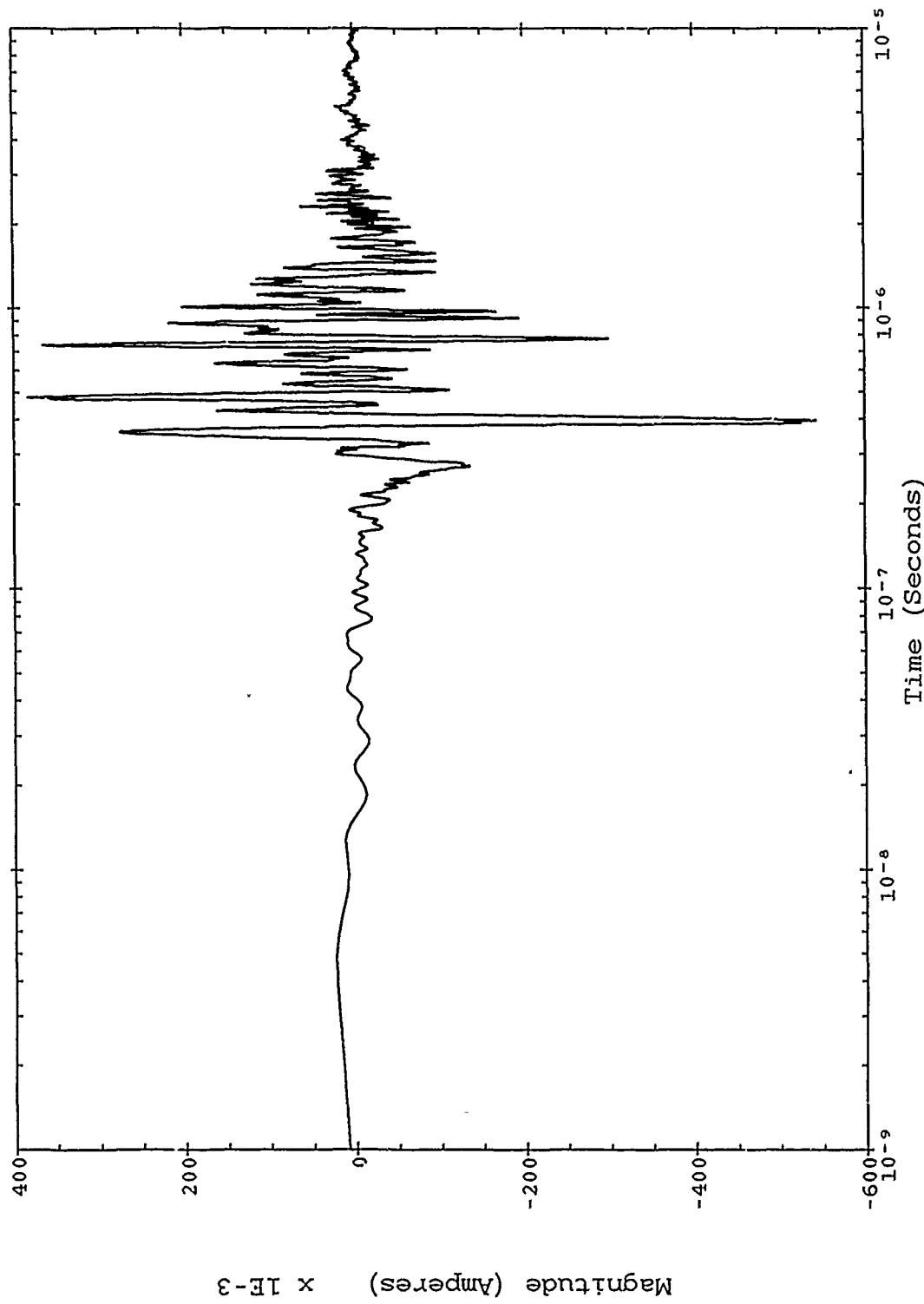


Figure B-4-34. Corrected TRESTLE data; TP 8806 SN 2197.

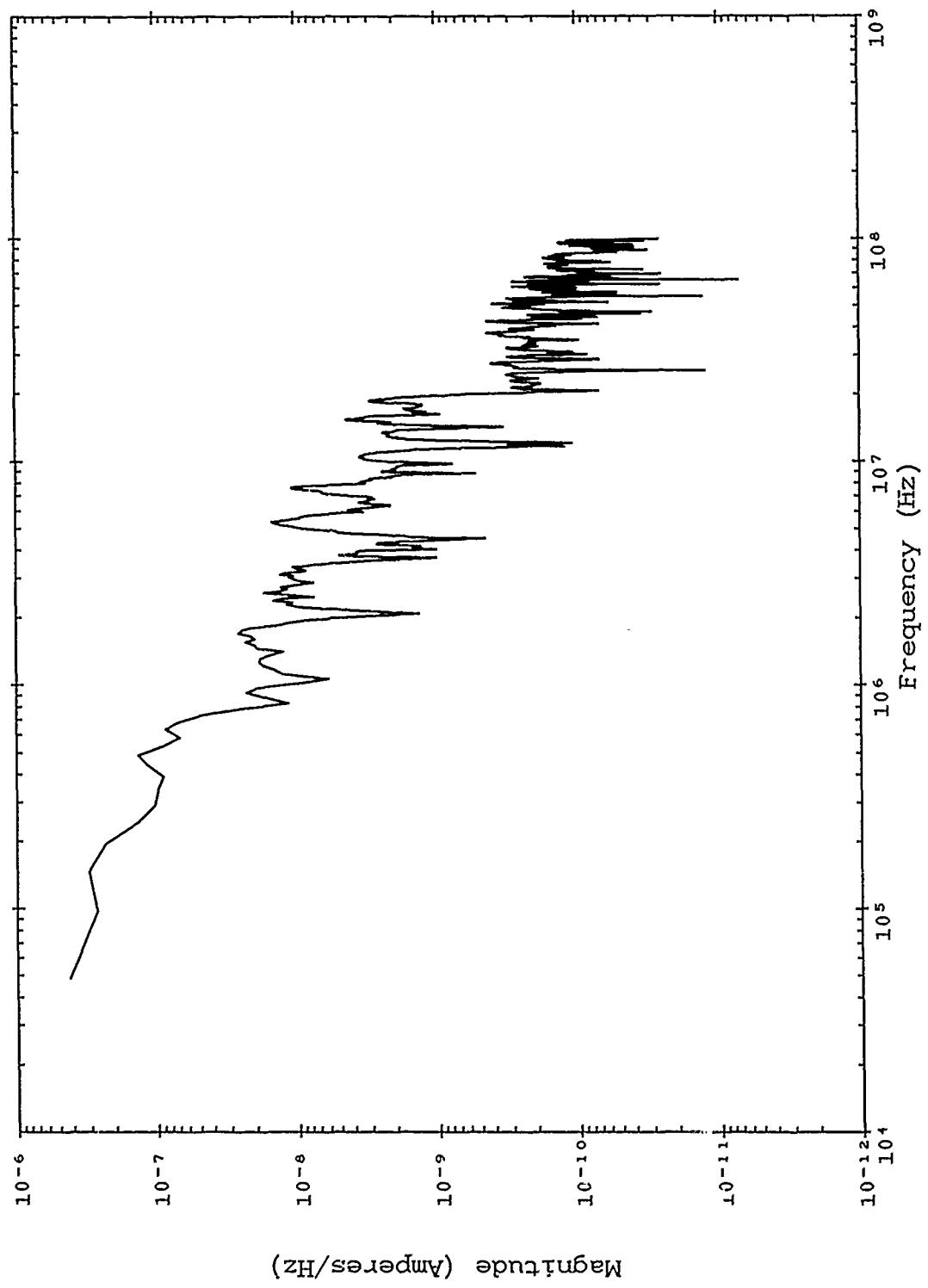


Figure B-435. Severe nearby lightning threat; TP 8806 SN 2197.

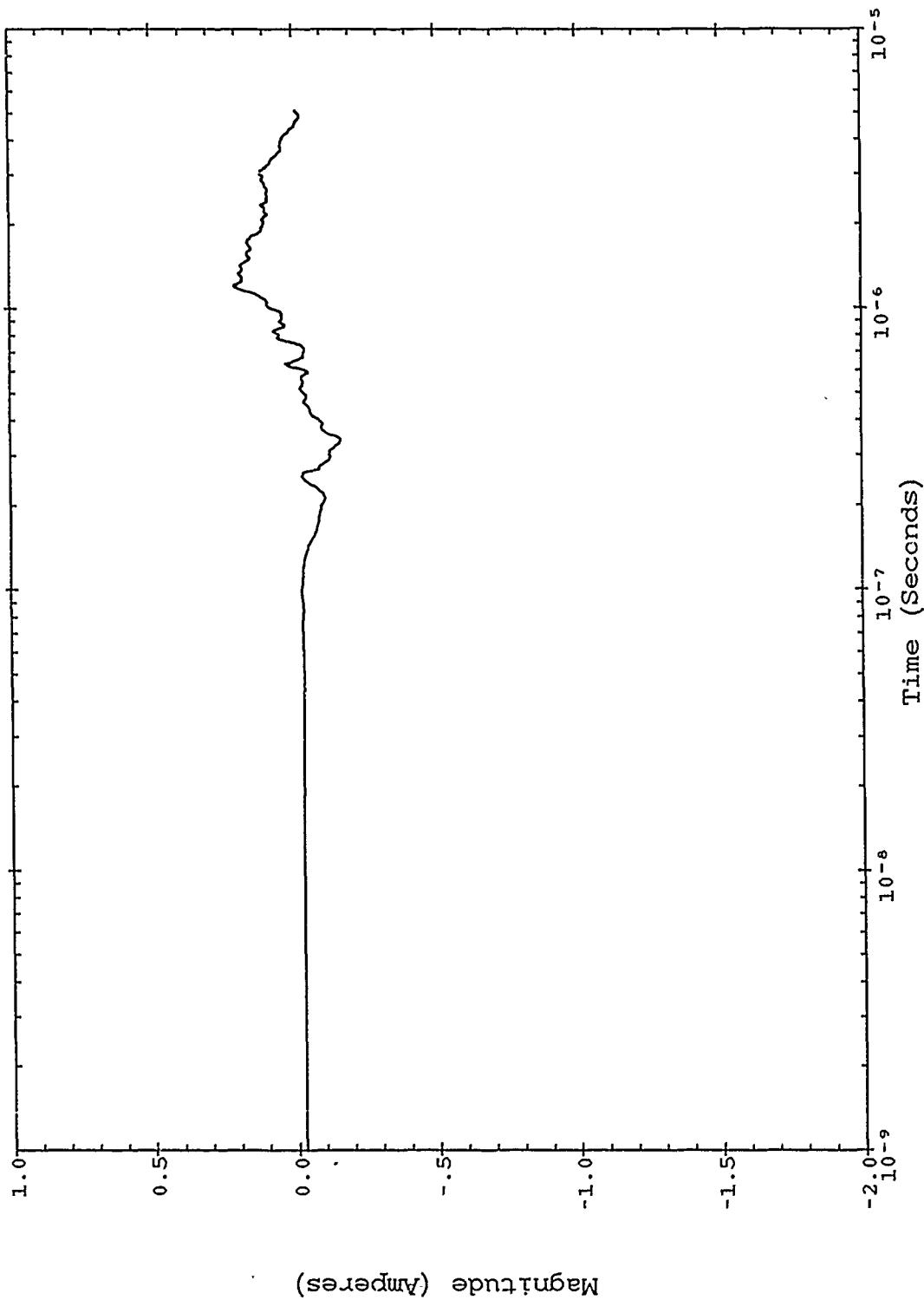


Figure B-436. Severe nearby lightning threat; TP 8806 SN 2197.

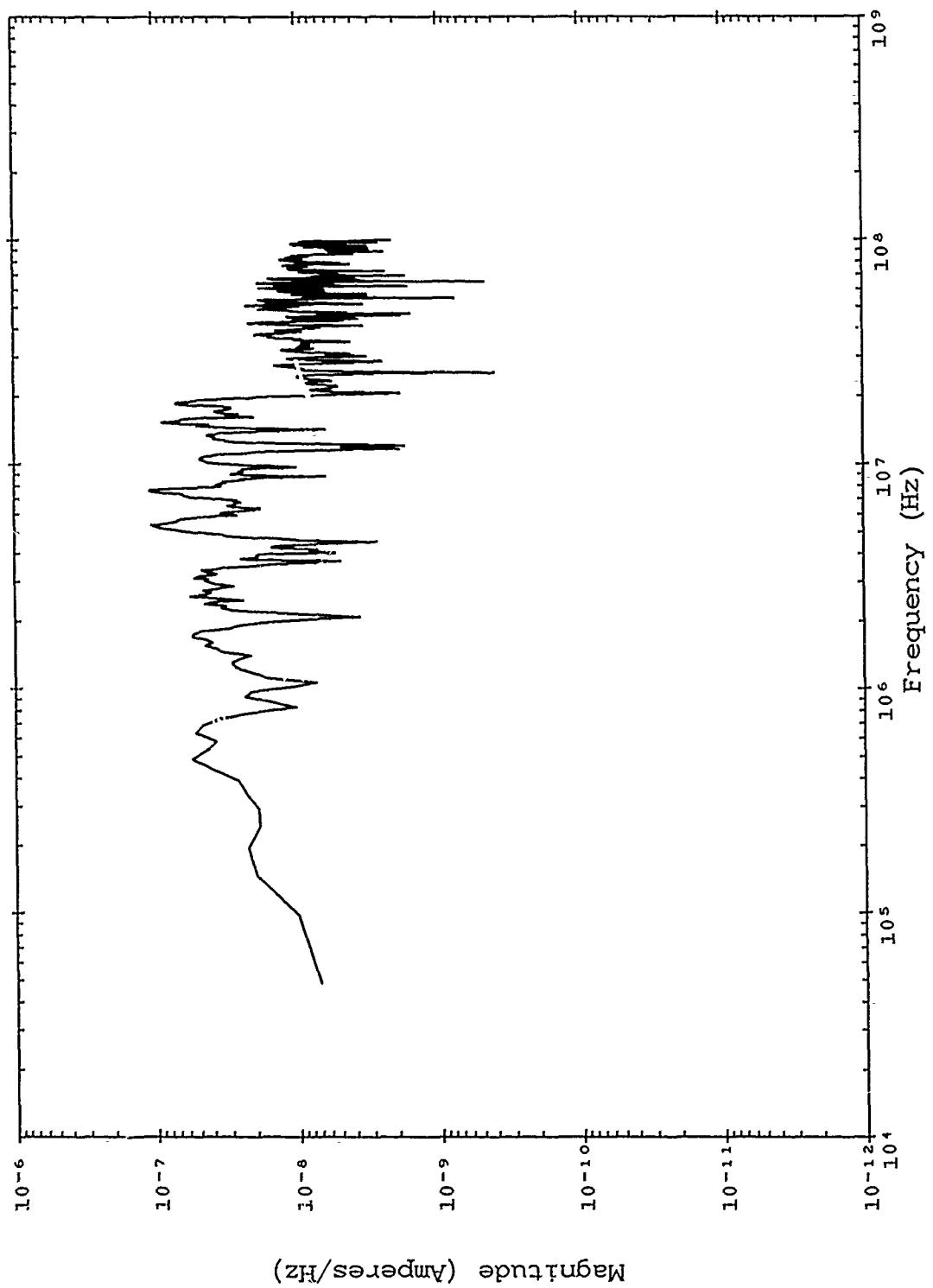


Figure B-437. Double exponential threat; TP 8806 SN 2197.

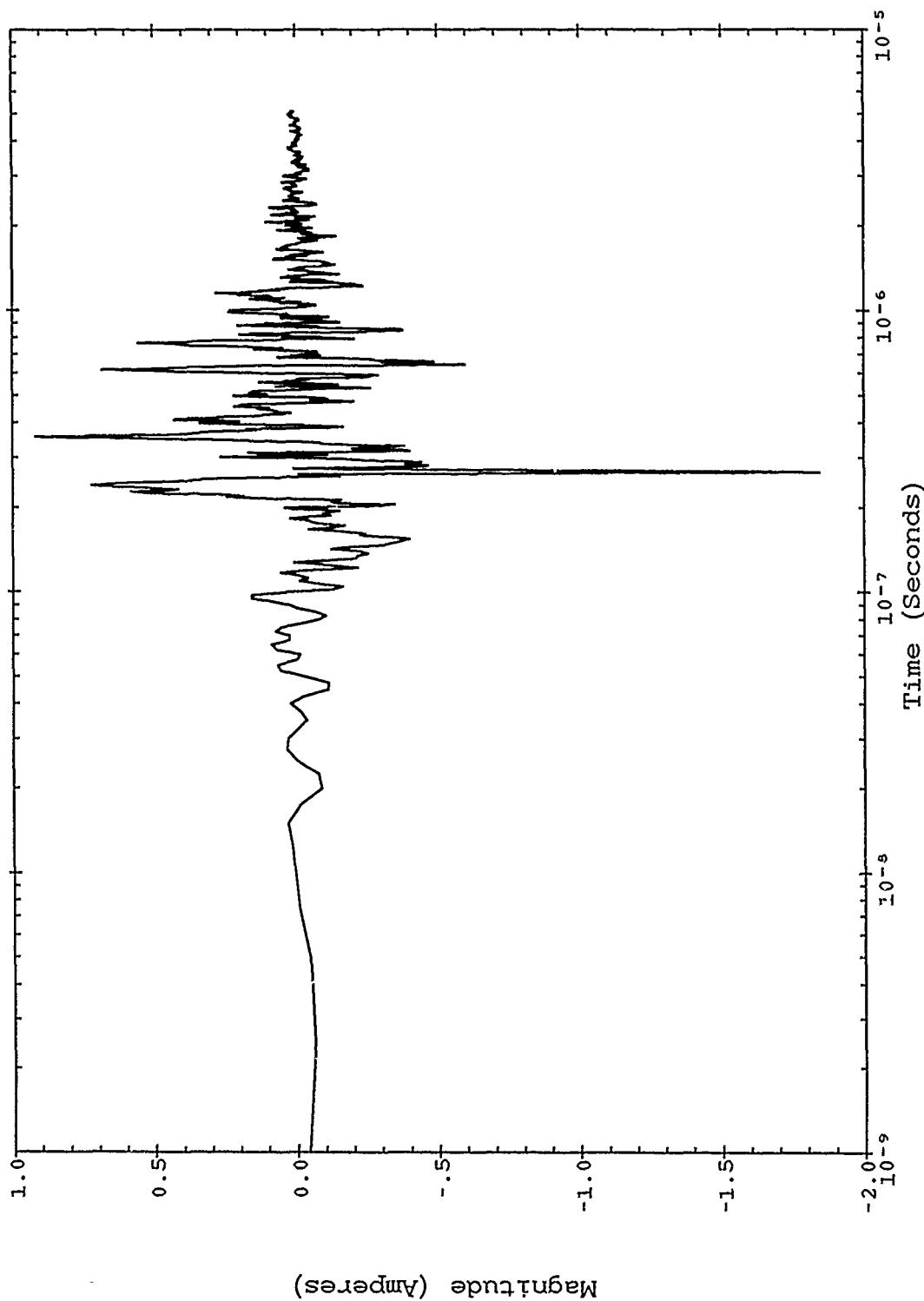


Figure B-438. Double exponential threat; TP 8806 SN 2197.

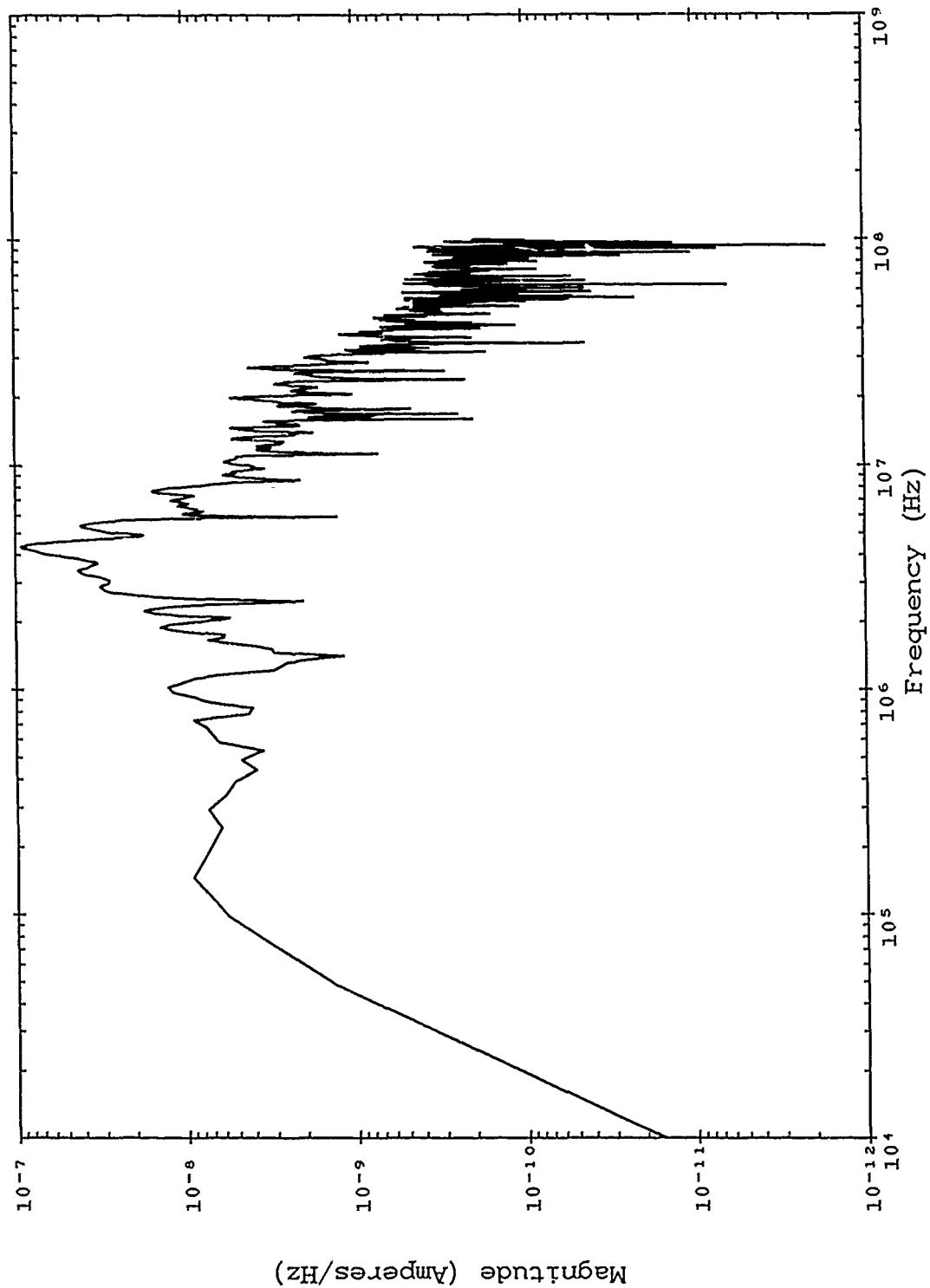


Figure B-439. Corrected TRESTLE data; TP 8877 SN 2276.

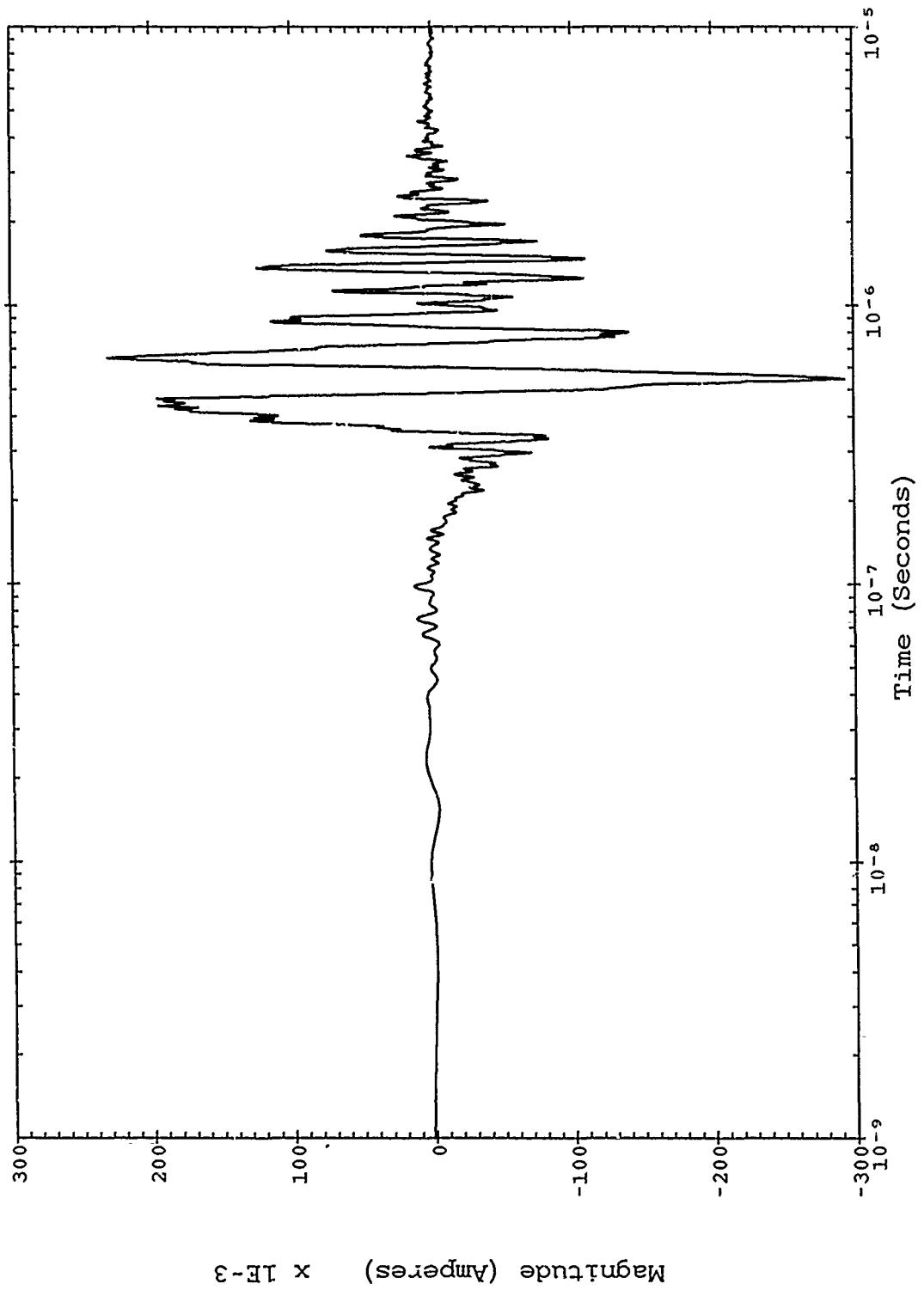


Figure B-440. Corrected TRESTLE data; TP 8877 SN 2276.

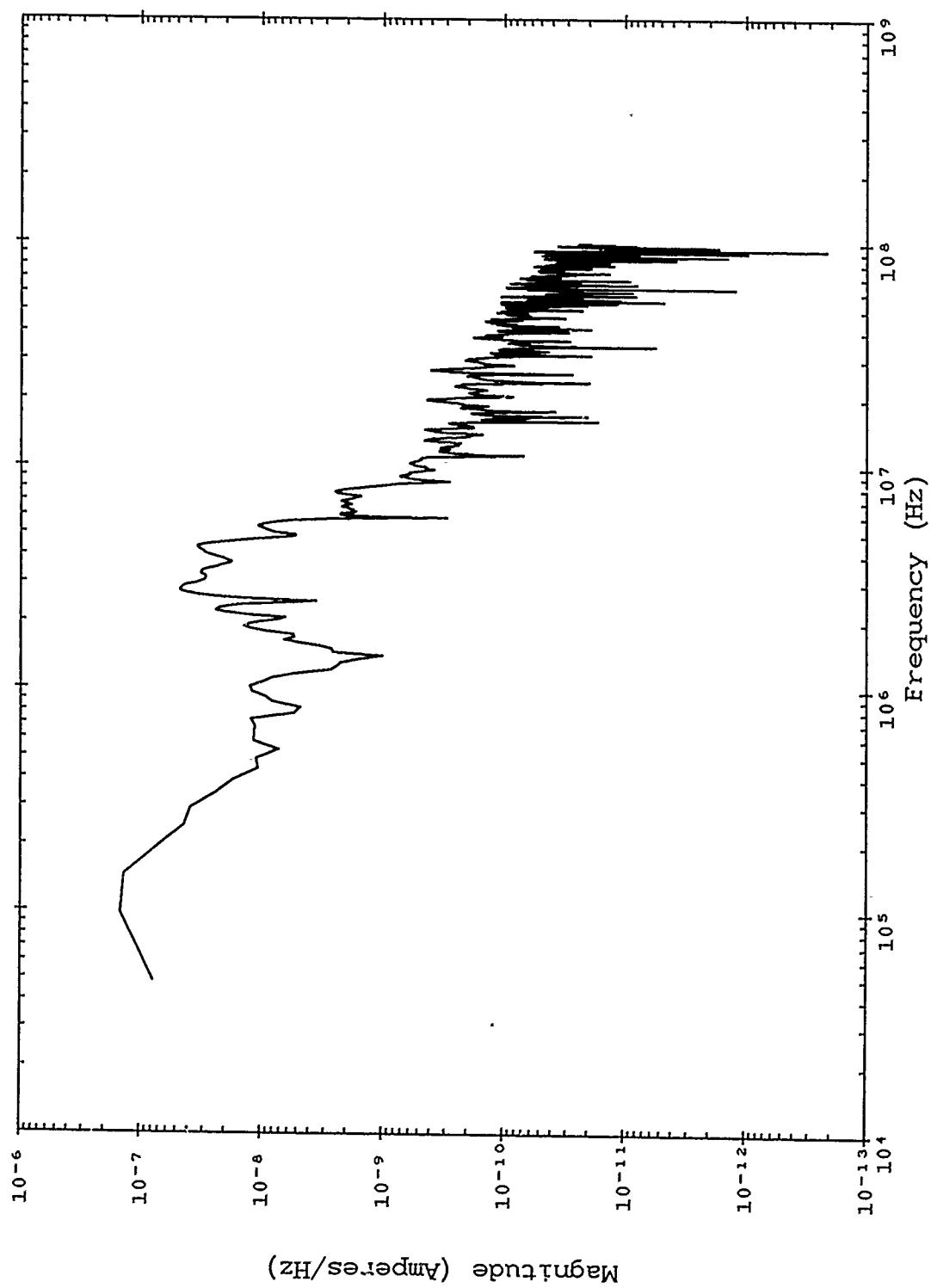


Figure B-441. Severe nearby lightning threat; TP 8877 SN 2276.

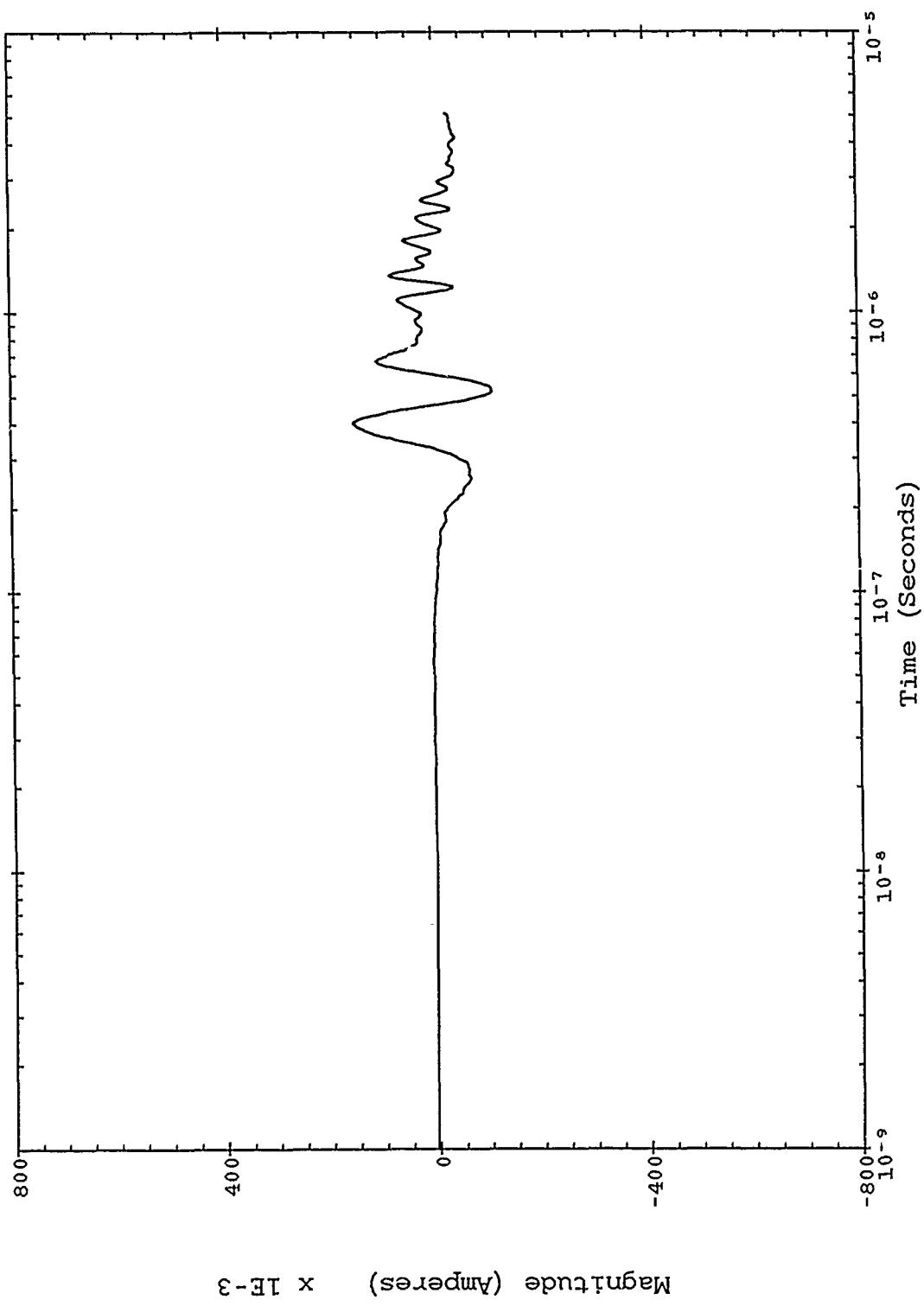


Figure B-442. Severe nearby lightning threat; TP 8877 SN 2276.

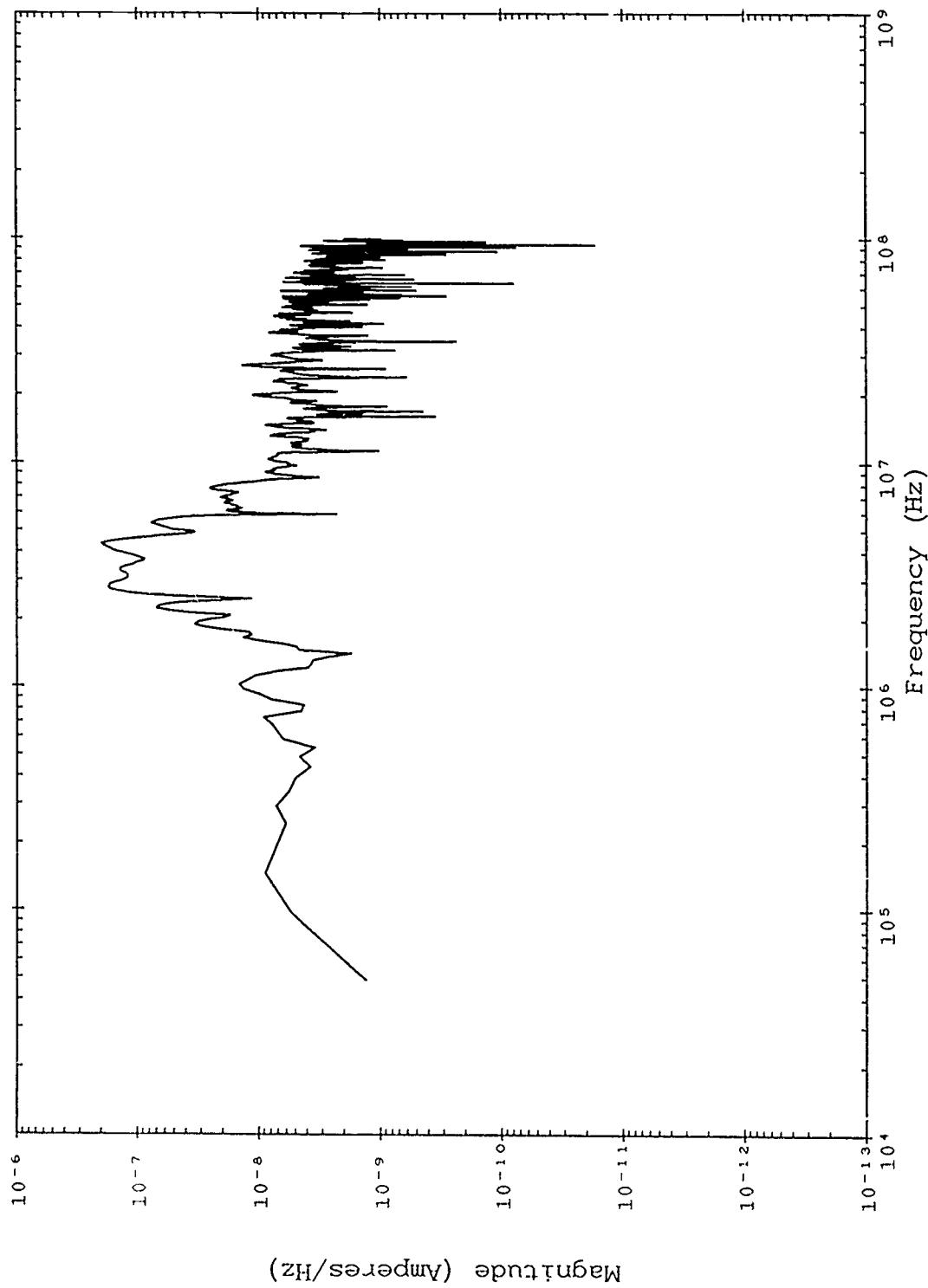


Figure B-443. Double exponential threat; TP 8877 SN 2276.

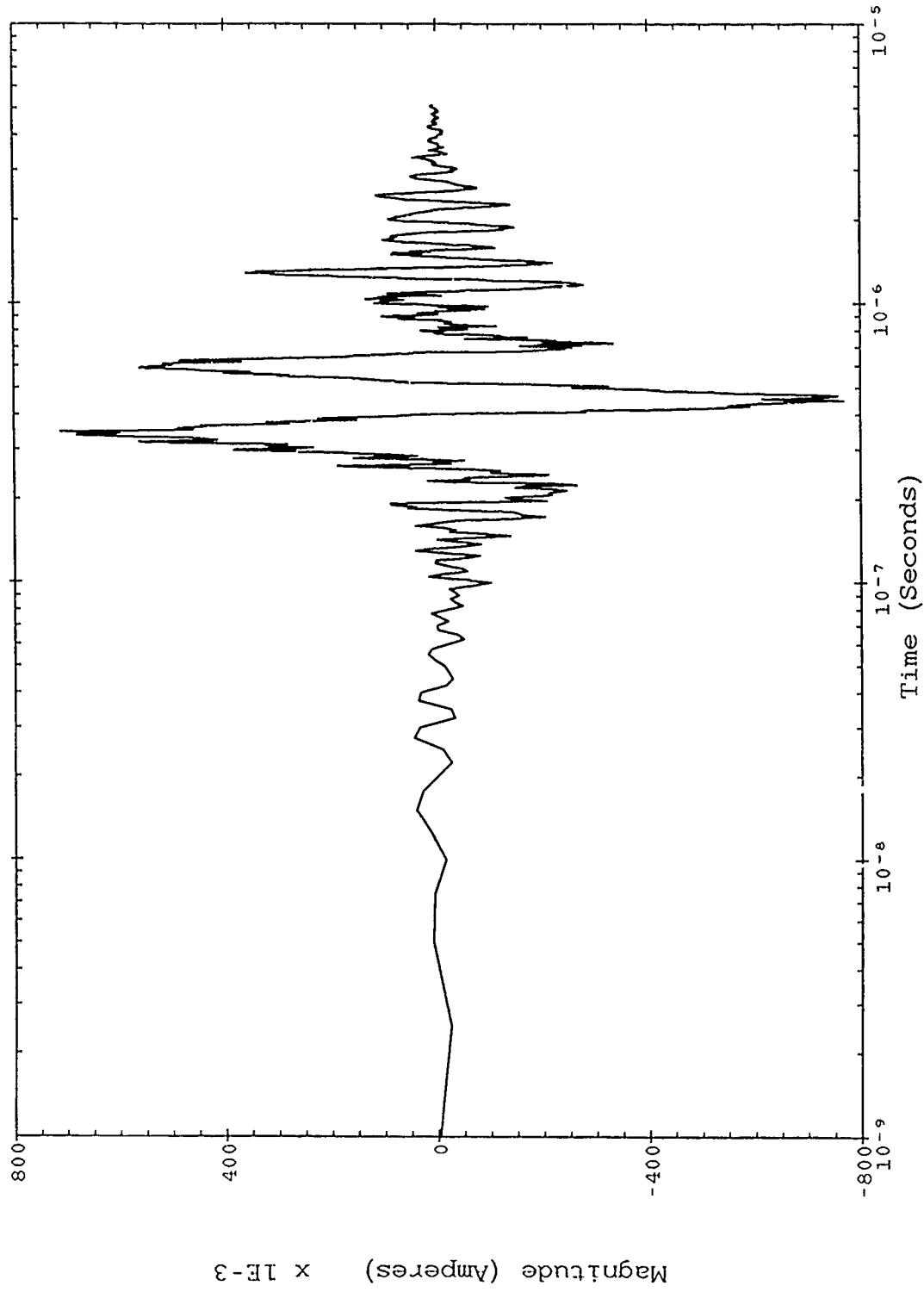


Figure B-441. Double exponential threat; TP 8877 SN 2276.

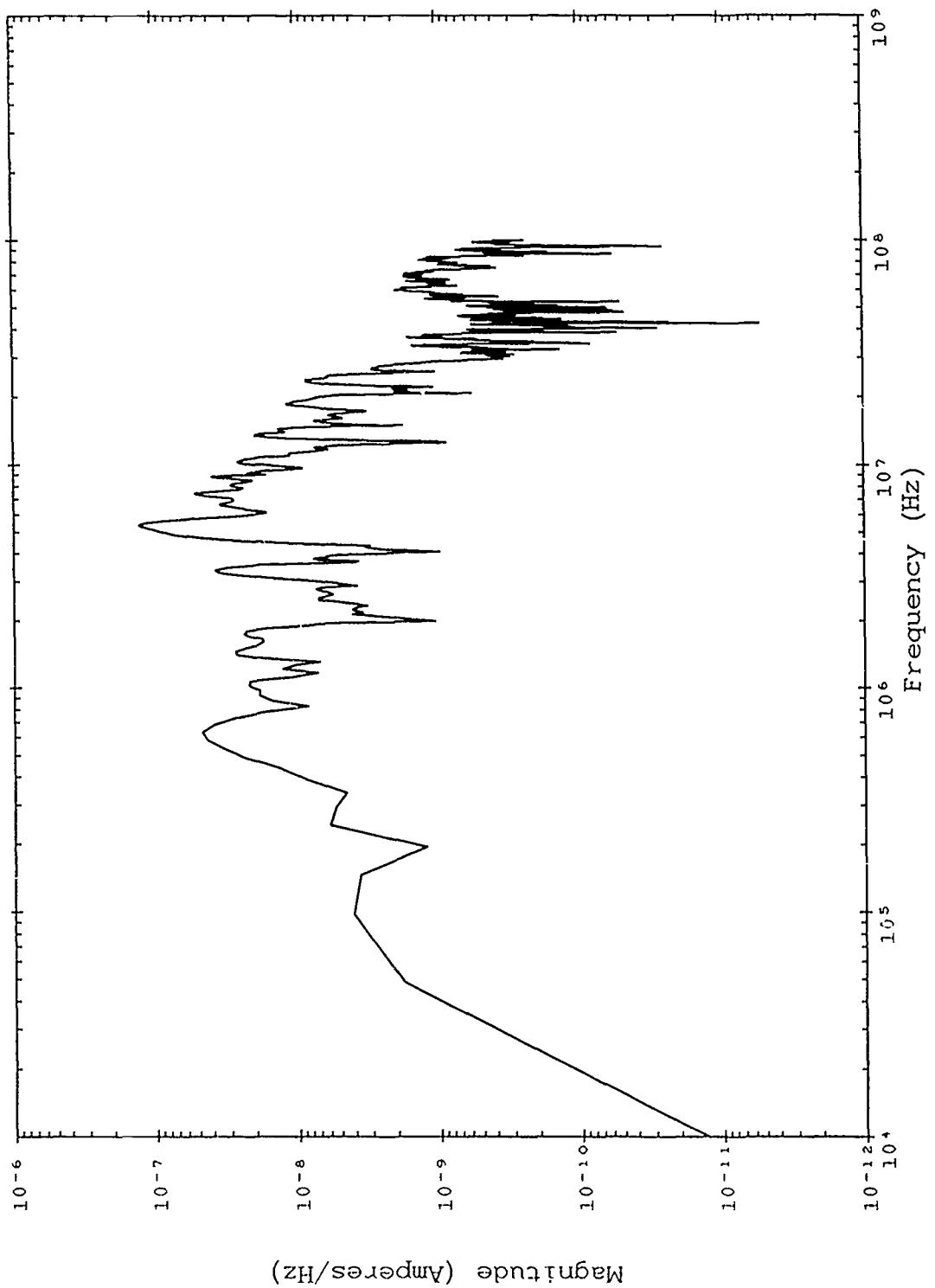


Figure B-445. Corrected TRESTLE data; TP 9063 SN 2265.

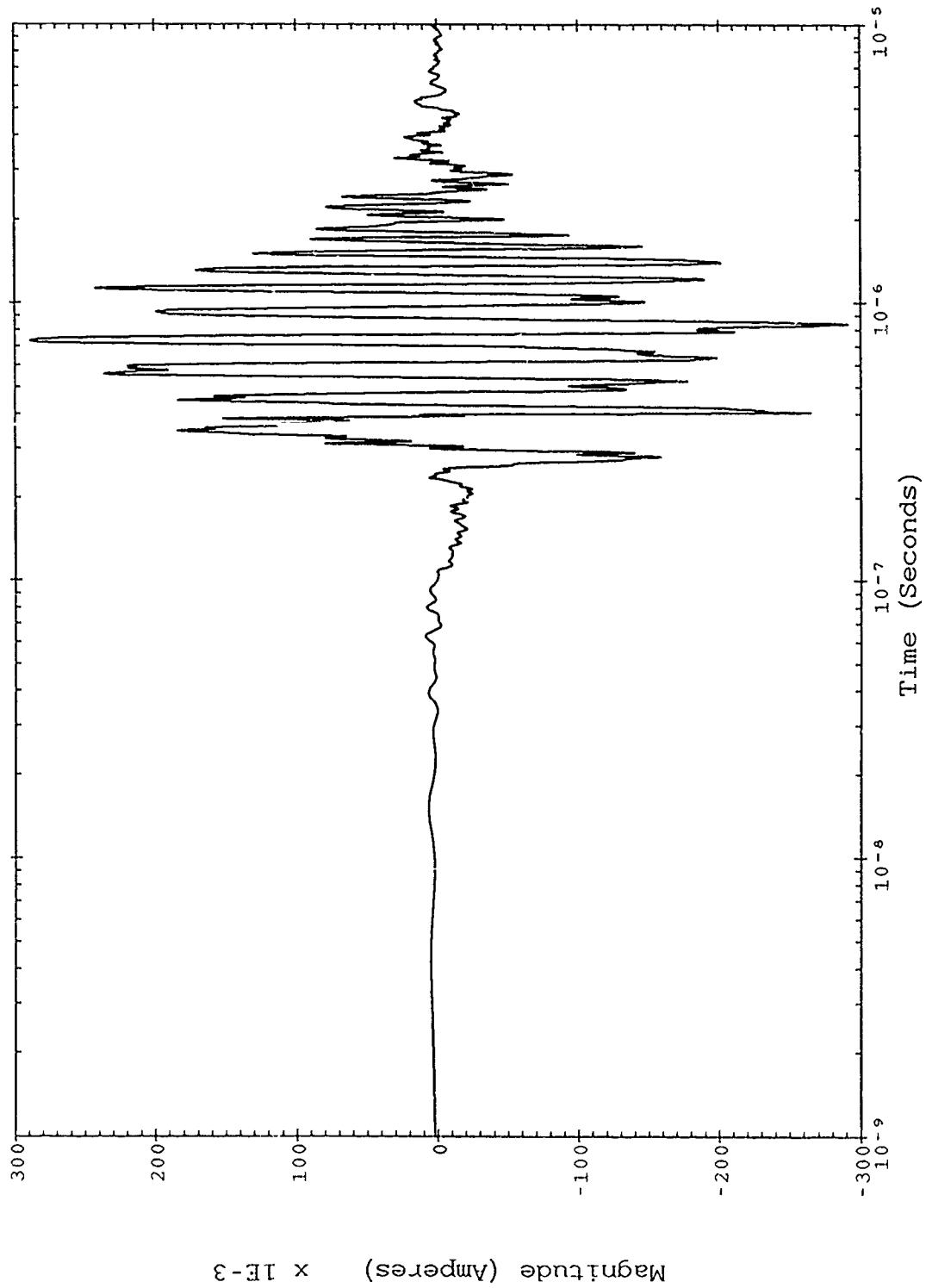


Figure B-446. Corrected TRESTLE data; TP 9063 SN 2265.

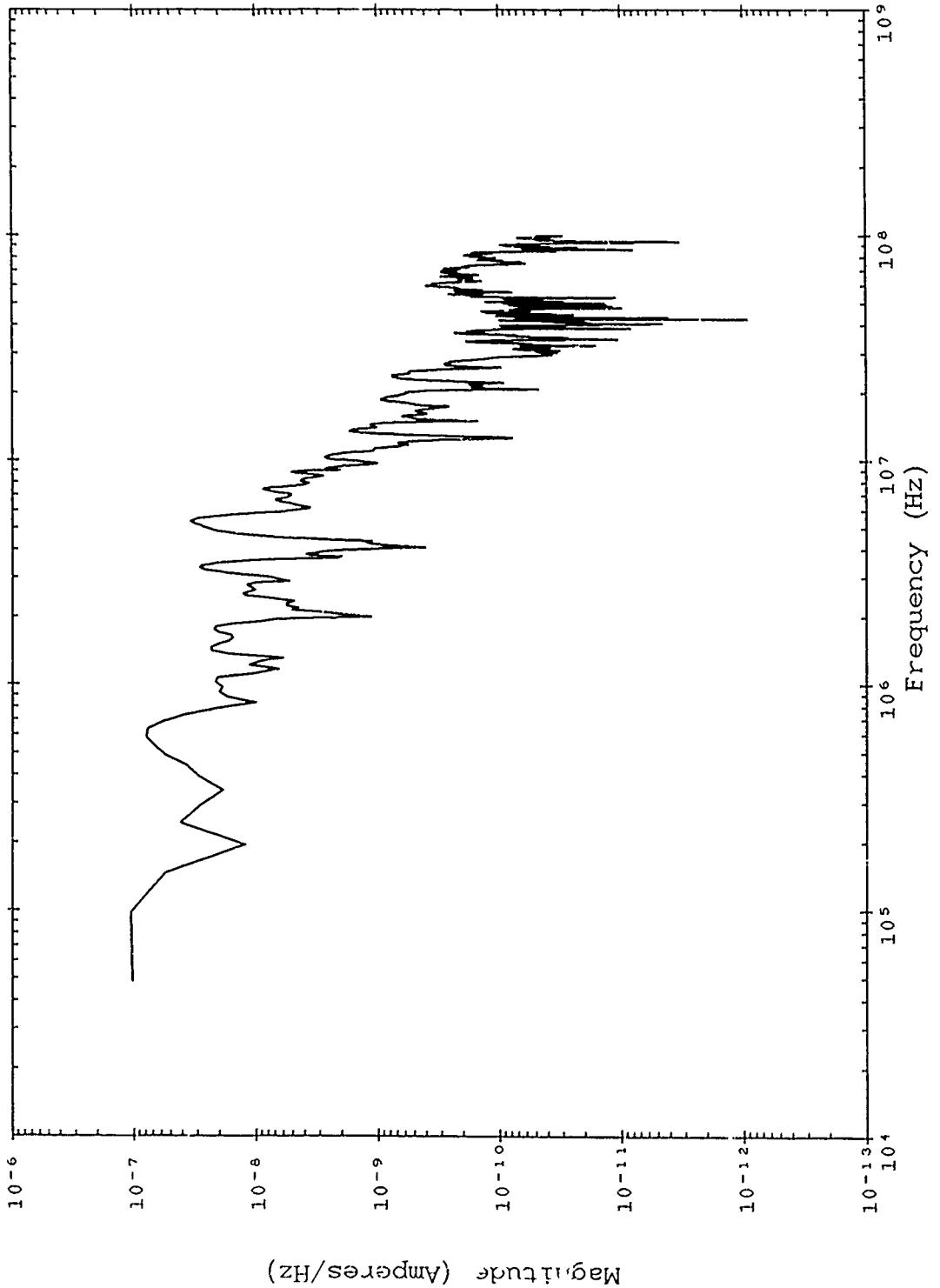


Figure B-447. Severe nearby lightning threat; TP 9063 SN 2265.

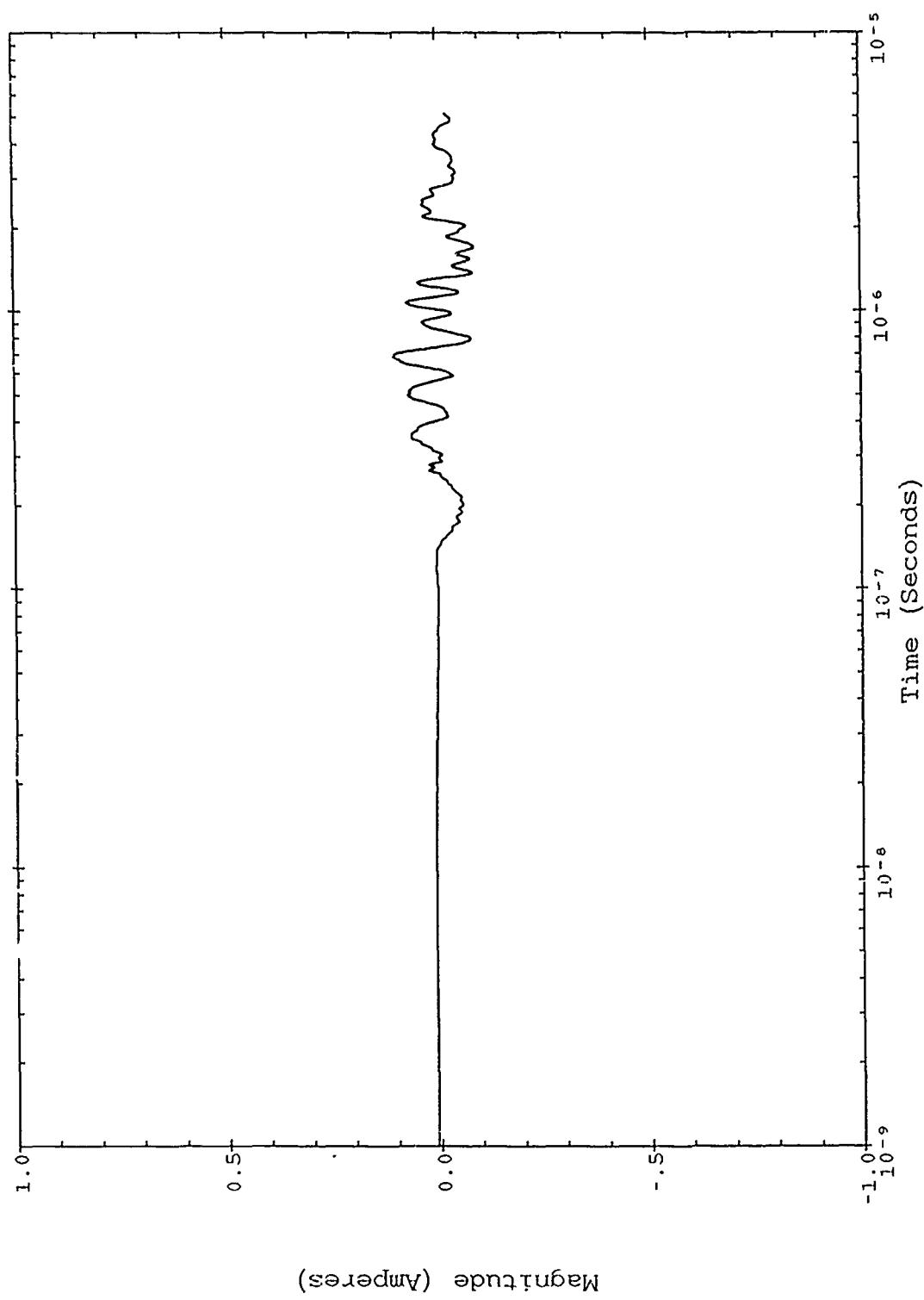


Figure B-446. Severe nearby lightning threat; TP 9063 SN 2265.

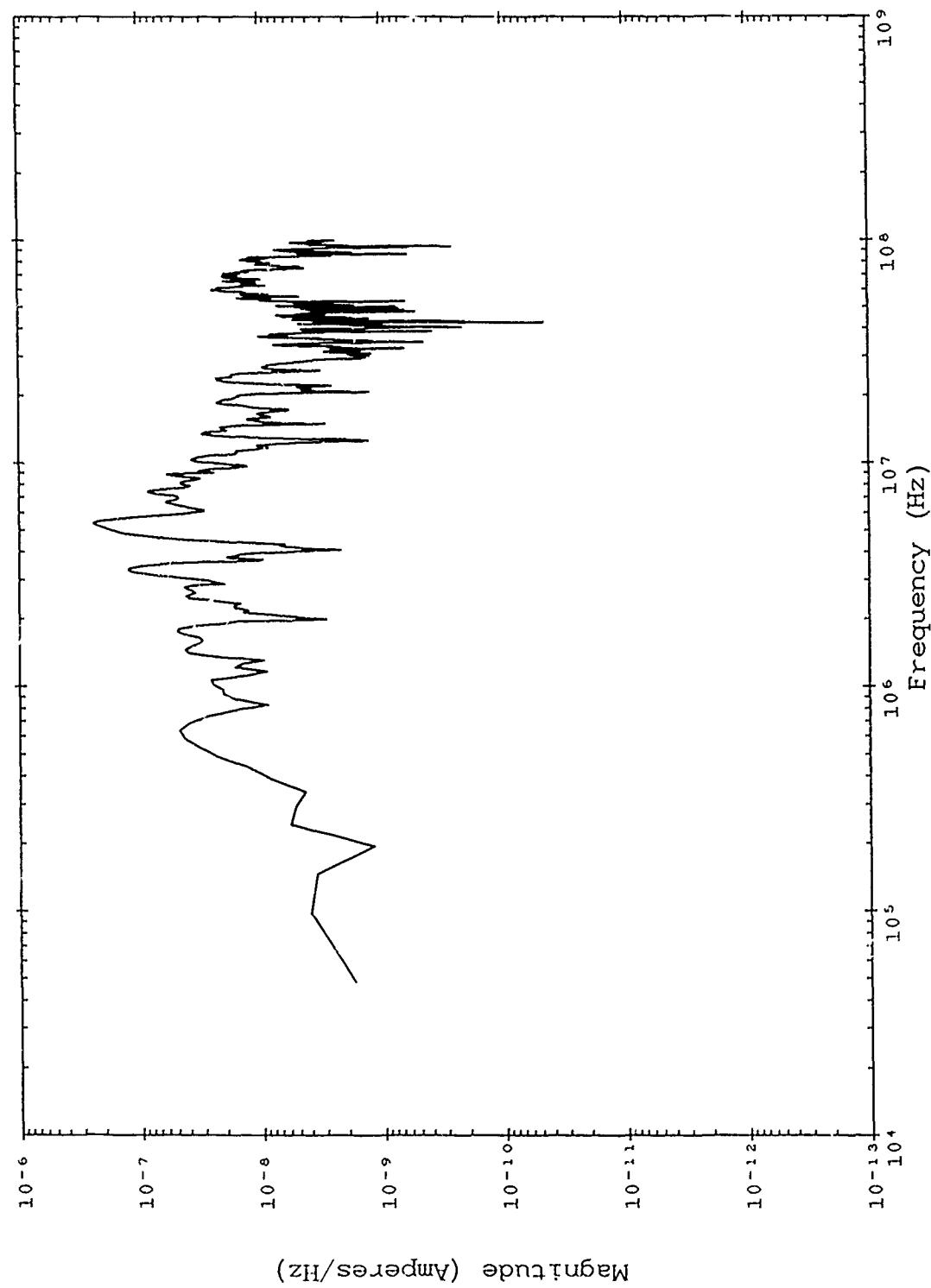


Figure B-449. Double exponential threat; TP 9063 SN 2265.

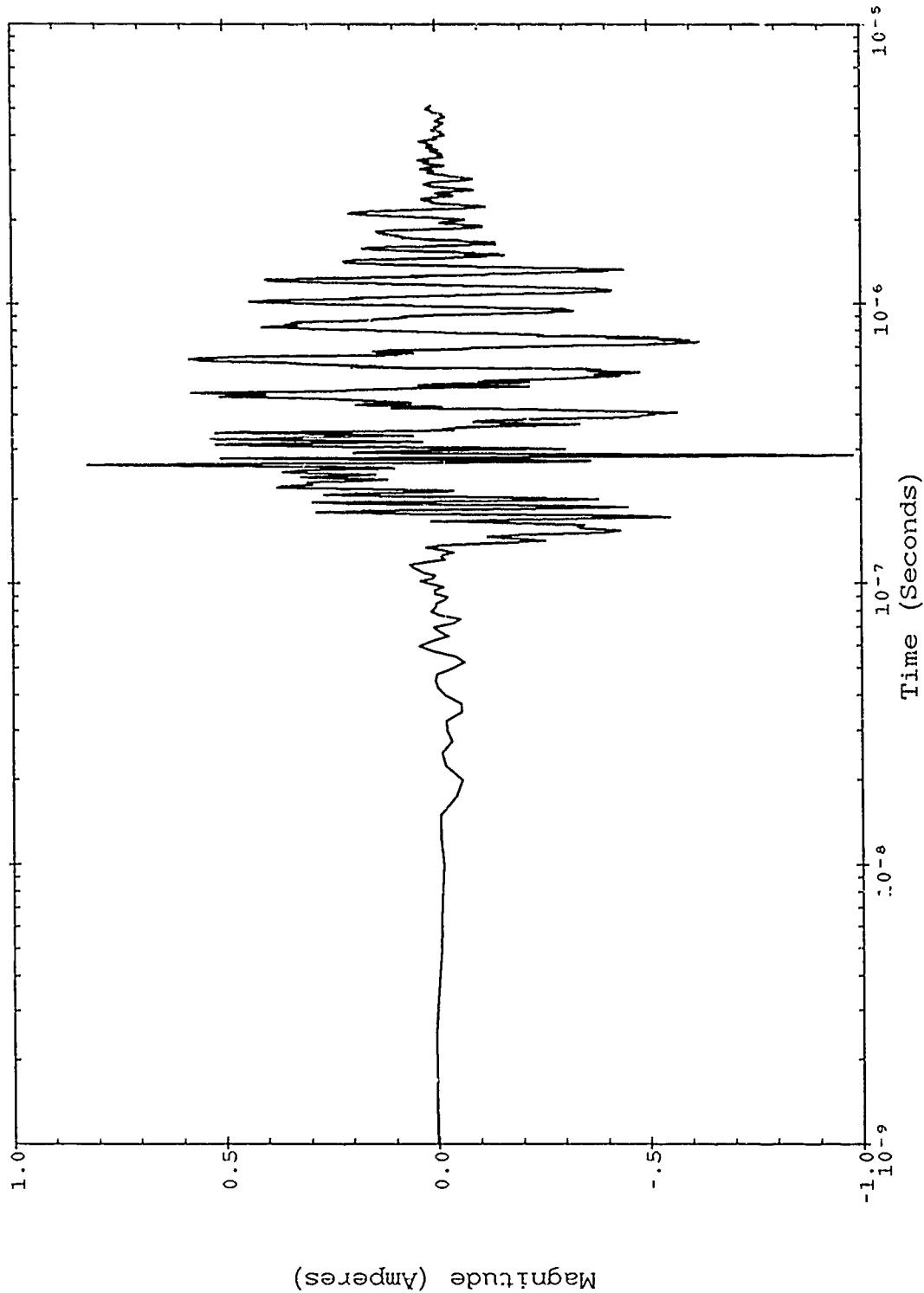


Figure B-450. Double exponential threat; TP 9063 SN 2265.

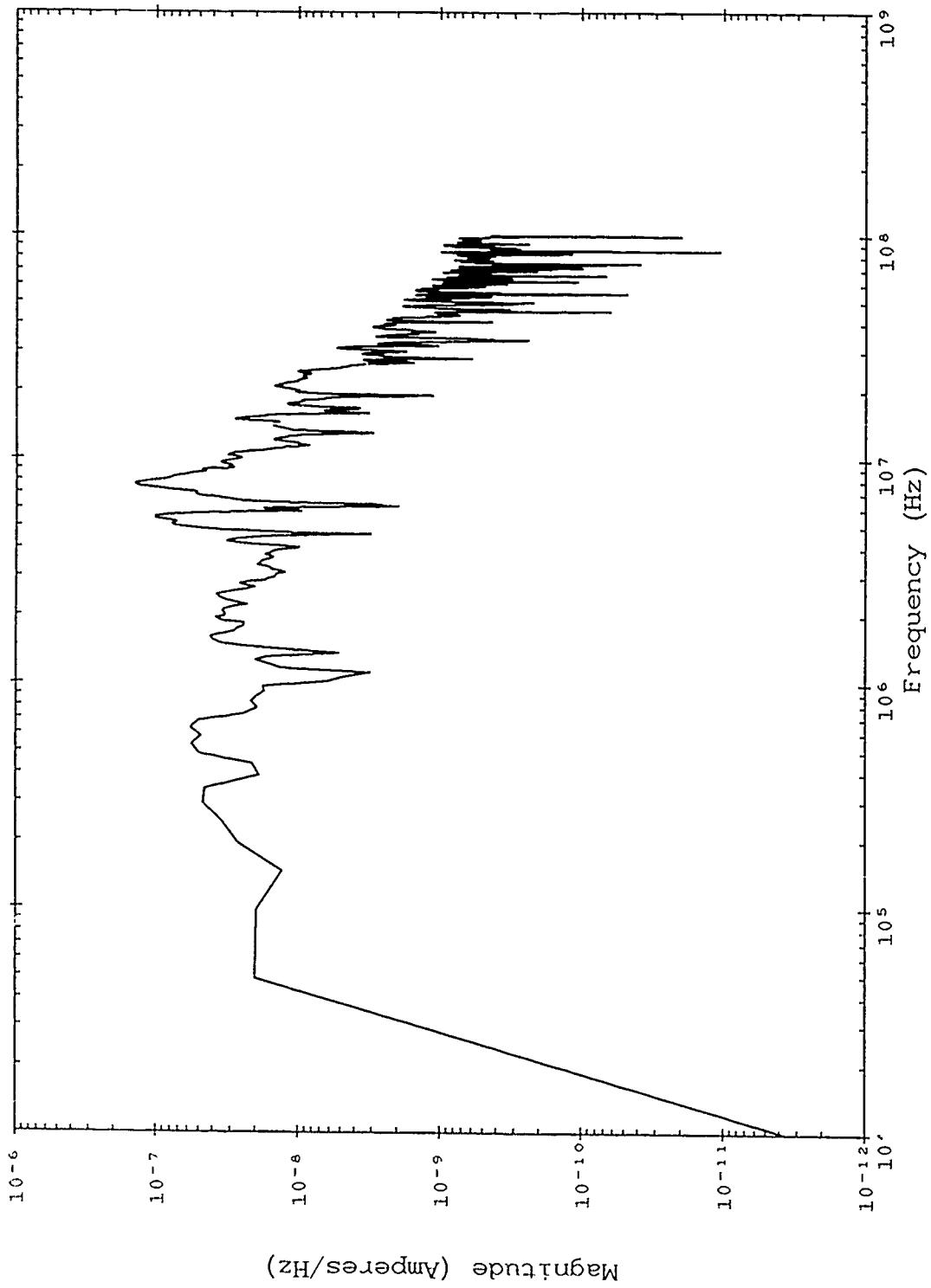


Figure B-451. Corrected TRESTLE data; TP 9082 SN 2609.

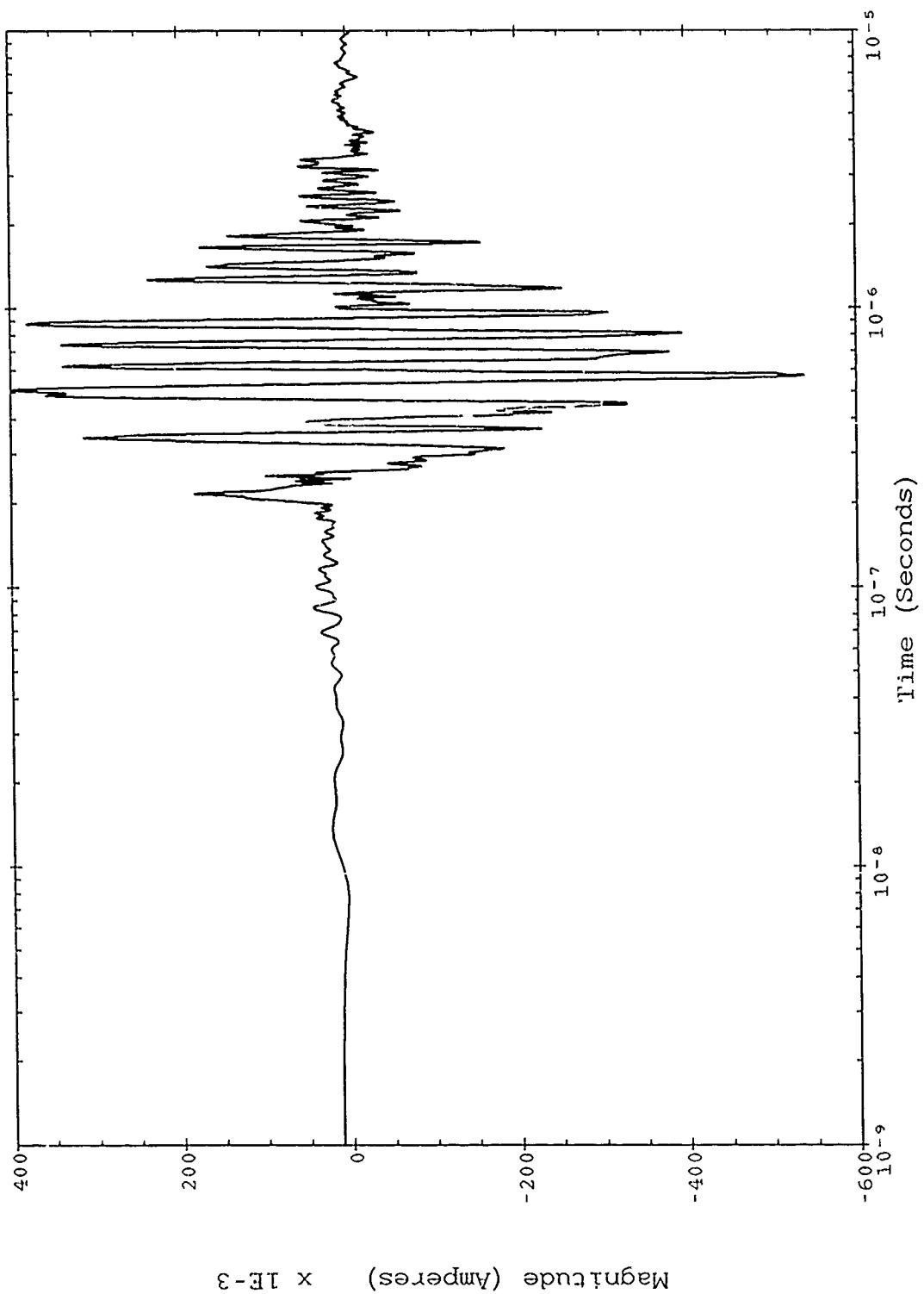


Figure B-452. Corrected TRESTLE data; TP 9082 SN 2609.

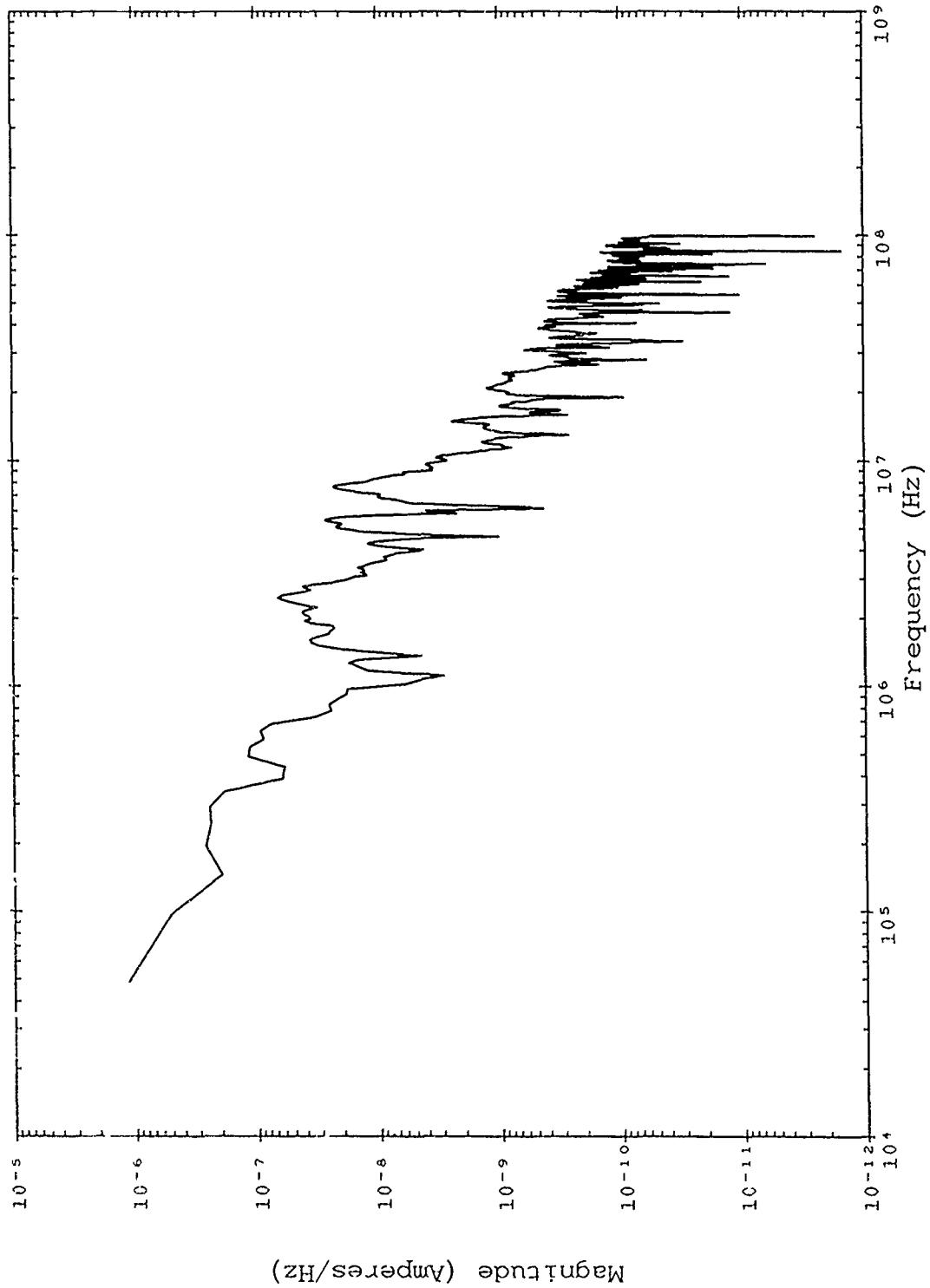


Figure B-453. Severe nearby lightning threat; TP 9082 SN 2609.

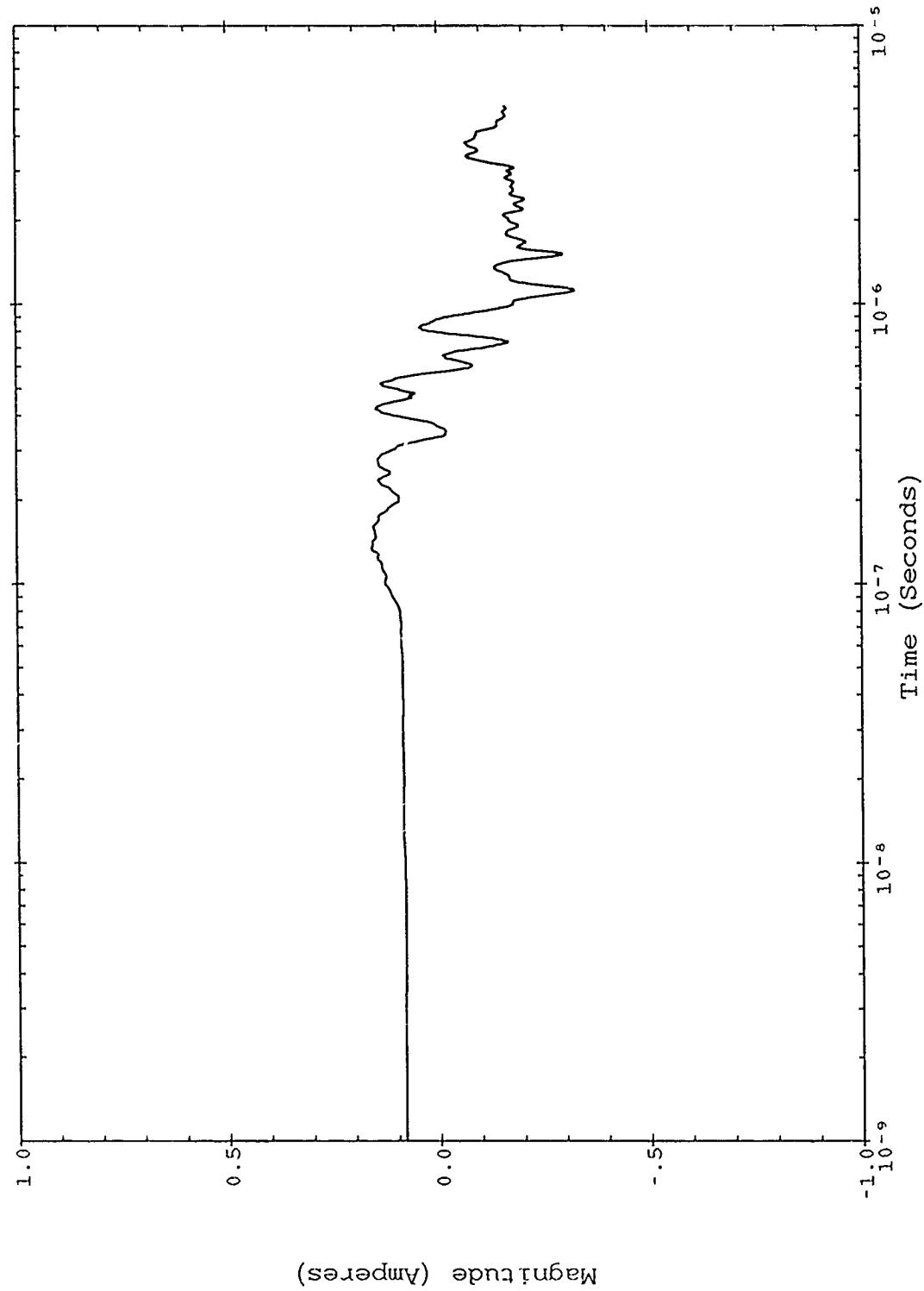


Figure B-154. Severe nearby lightning threat; TP 9082 SN 2609.

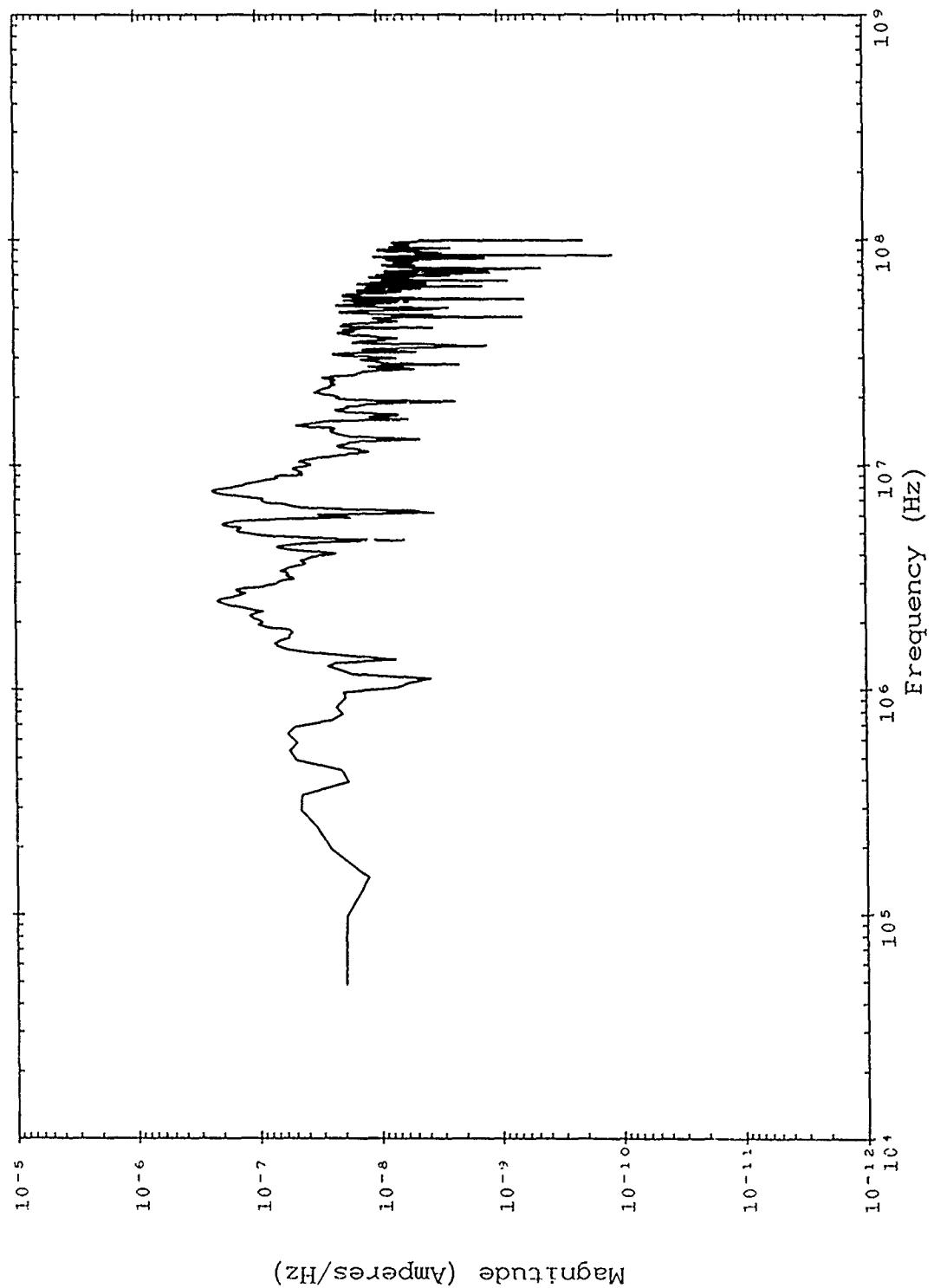


Figure B-455. Double exponential threat; TP 9082 SN 2609.

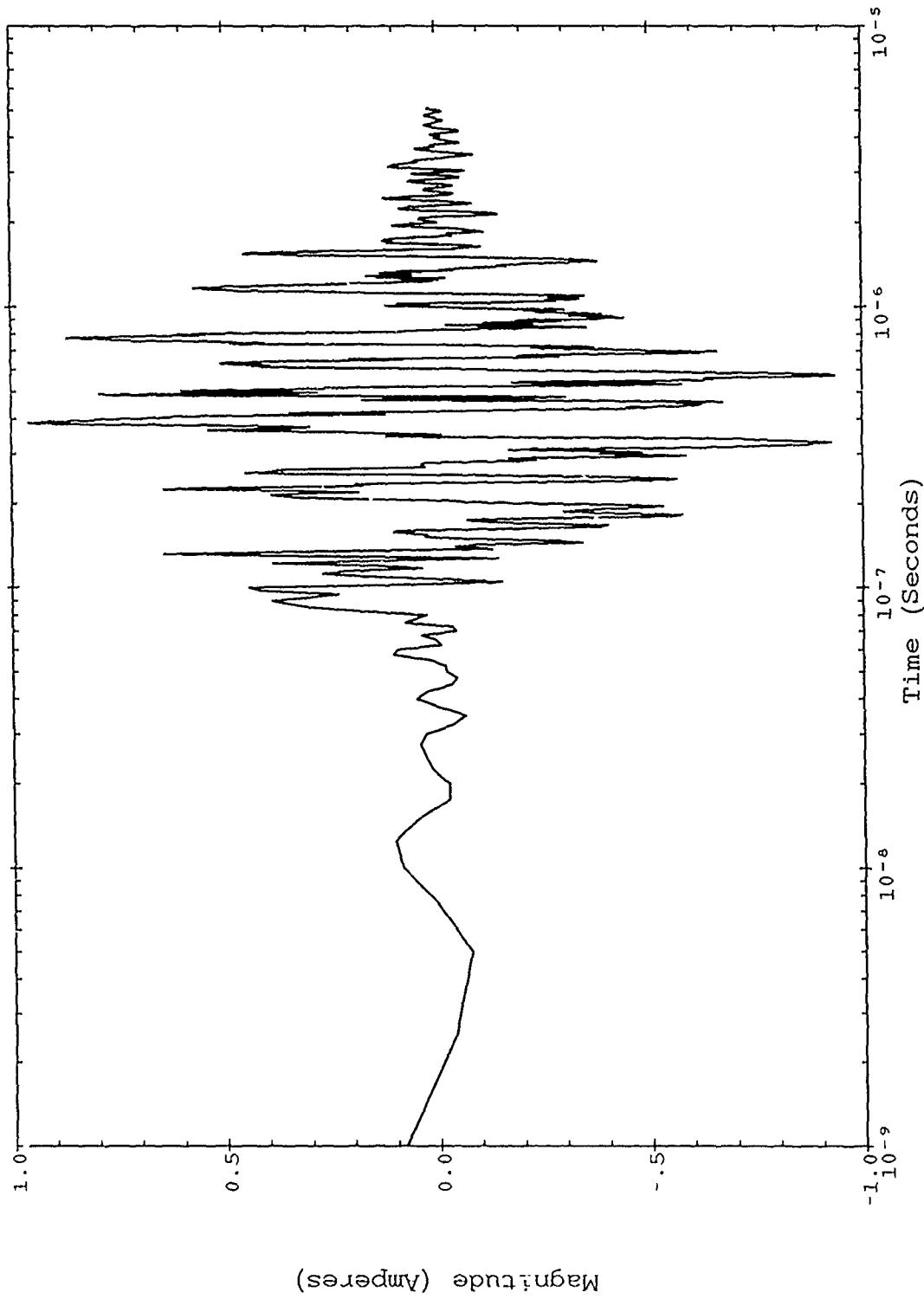


Figure B-456. Double exponential threat; TP 9082 SN 2609.

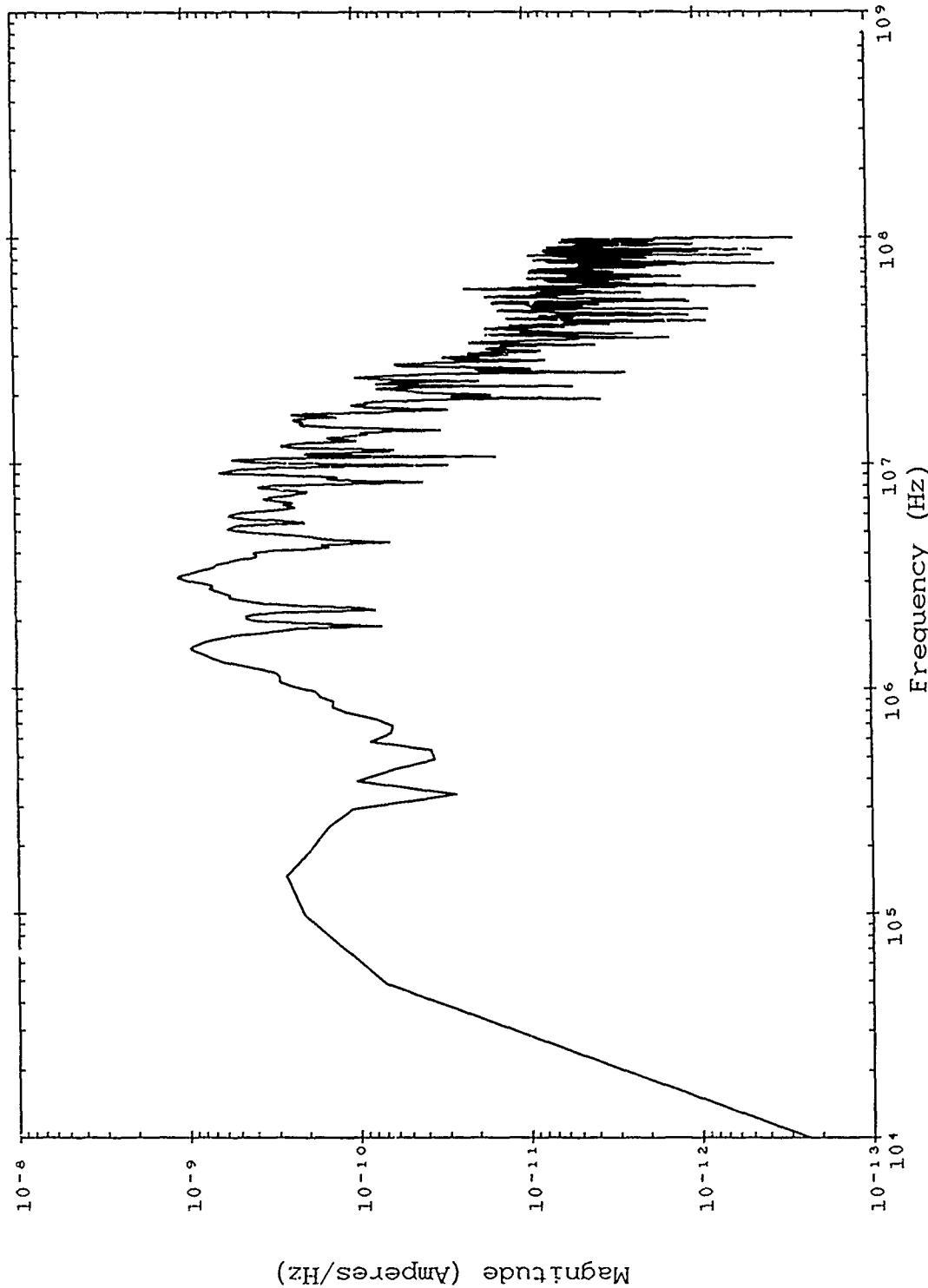


Figure B-457. Corrected TRESTLE data; TP 9323 SN 2605.

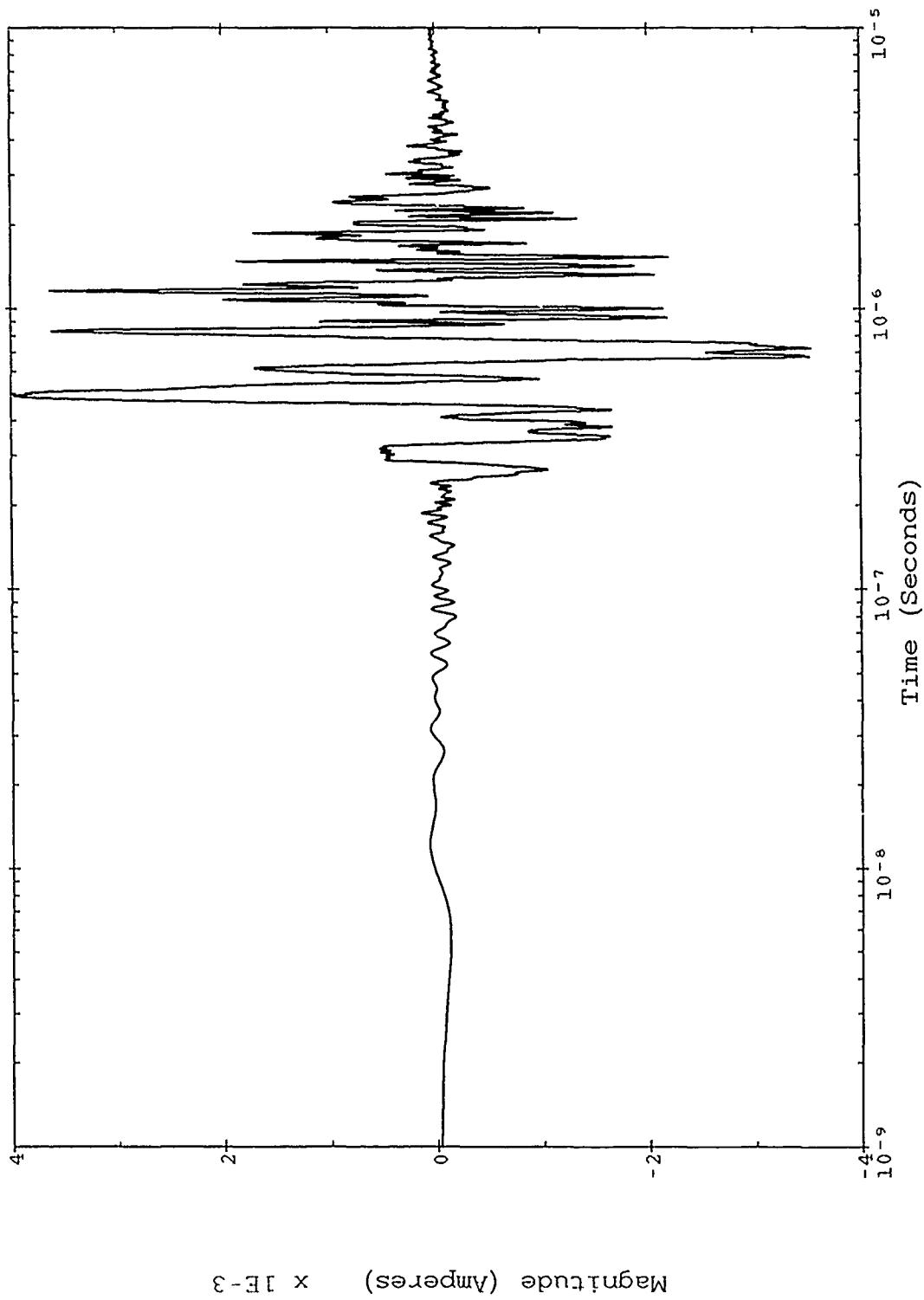


Figure B-458. Corrected TRESTLE data; TF 9323 SN 2605.

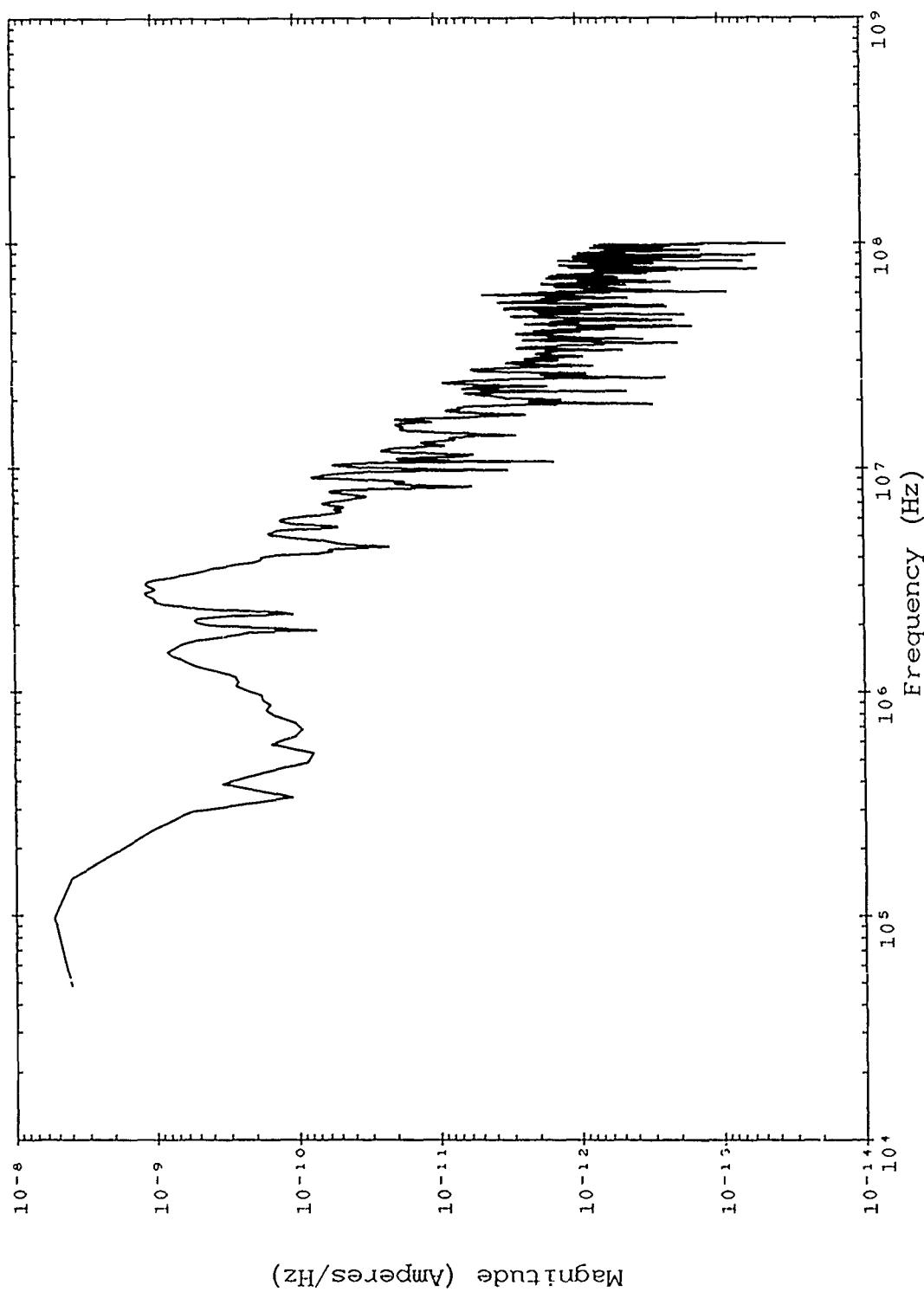


Figure B-459. Severe nearby lightning threat; TP 9323 SN 2605.

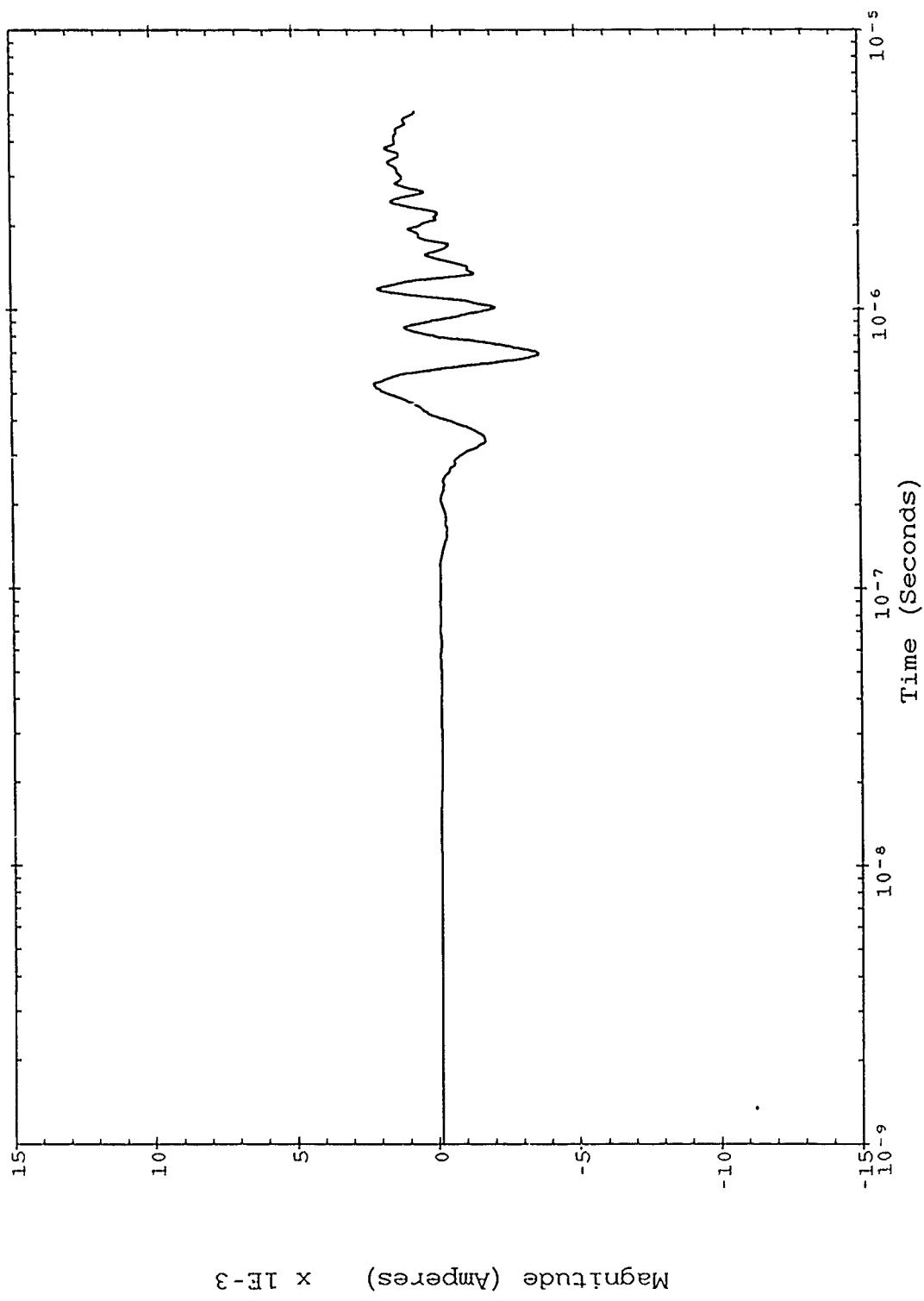


Figure B-460. Severe nearby lightning threat; TP 9323 SN 2605.

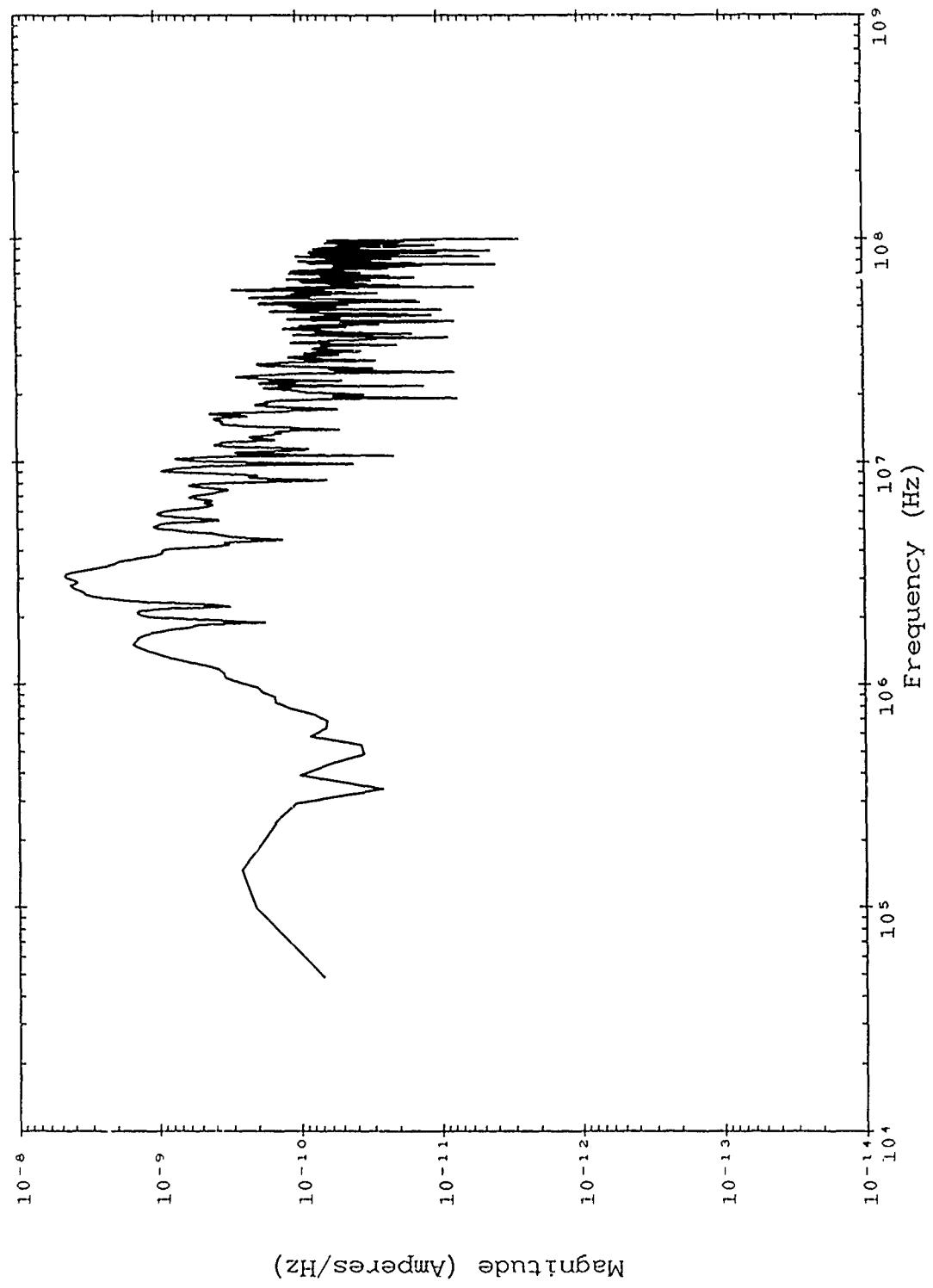


Figure B-461. Double exponential threat; TP 9323 SN 2605.

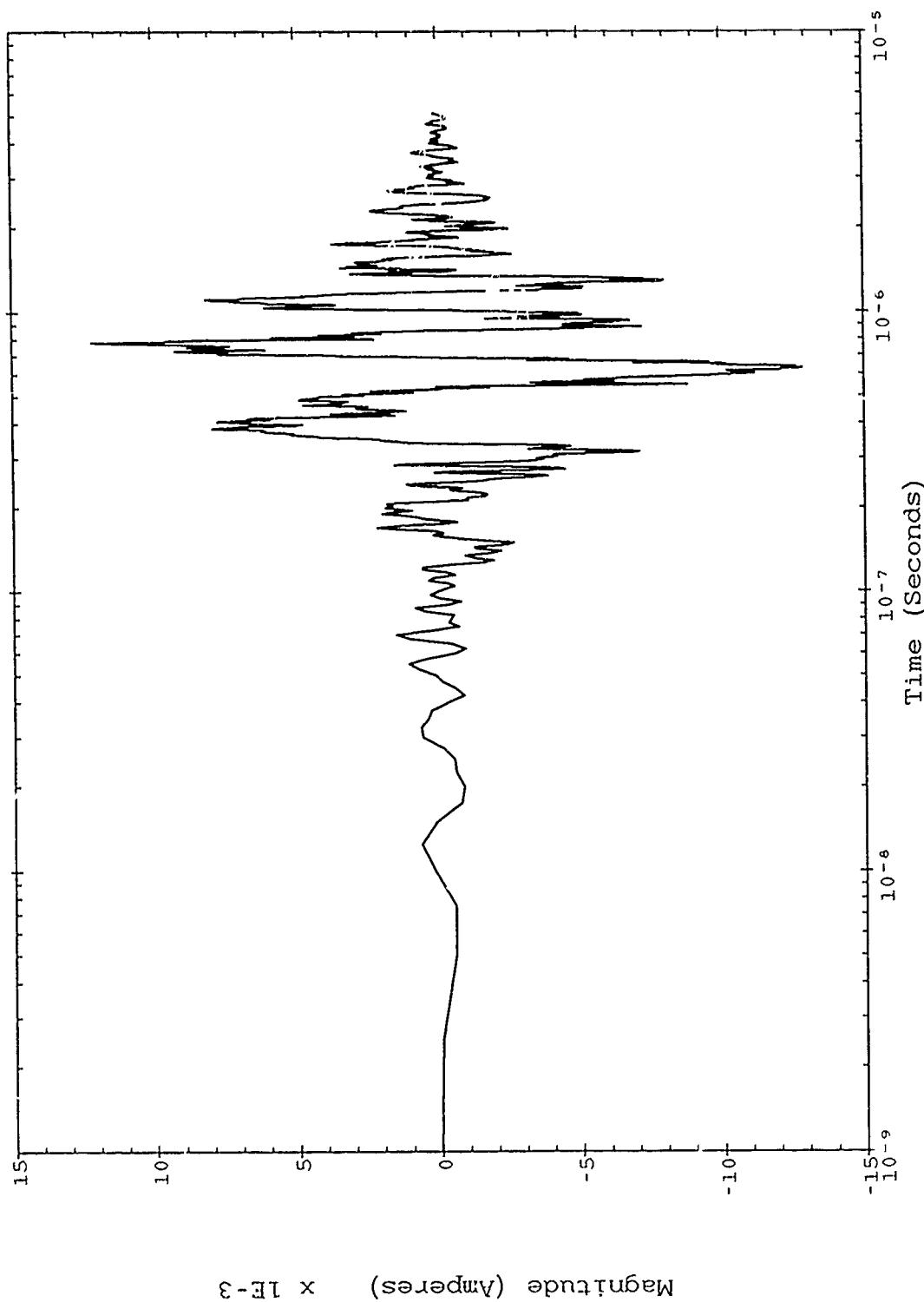


Figure B-462. Double exponential threat; 1^D 9323 SN 2605.

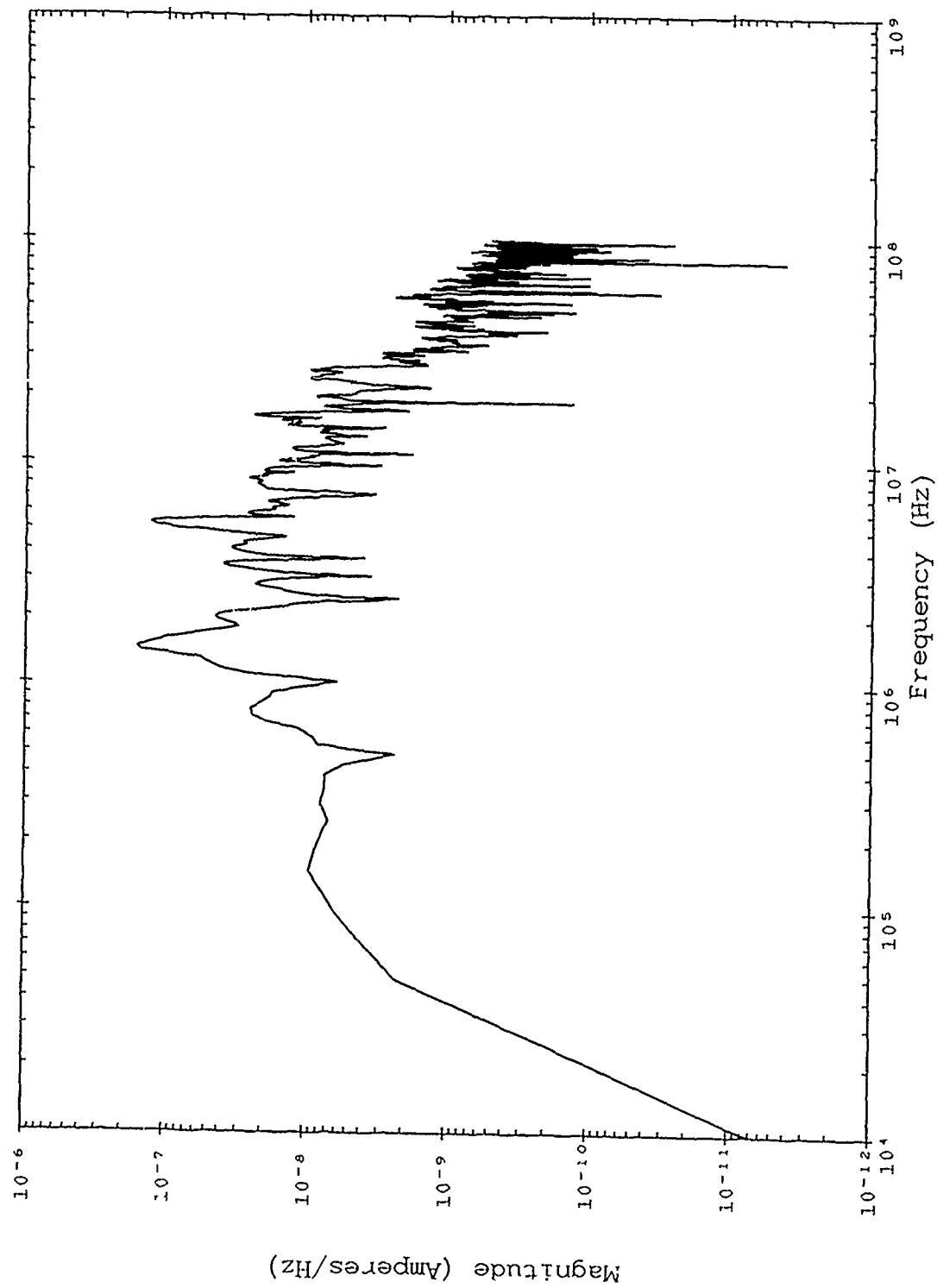


Figure B-463. Corrected TRESTLE data; TP 9406 SN 2421.

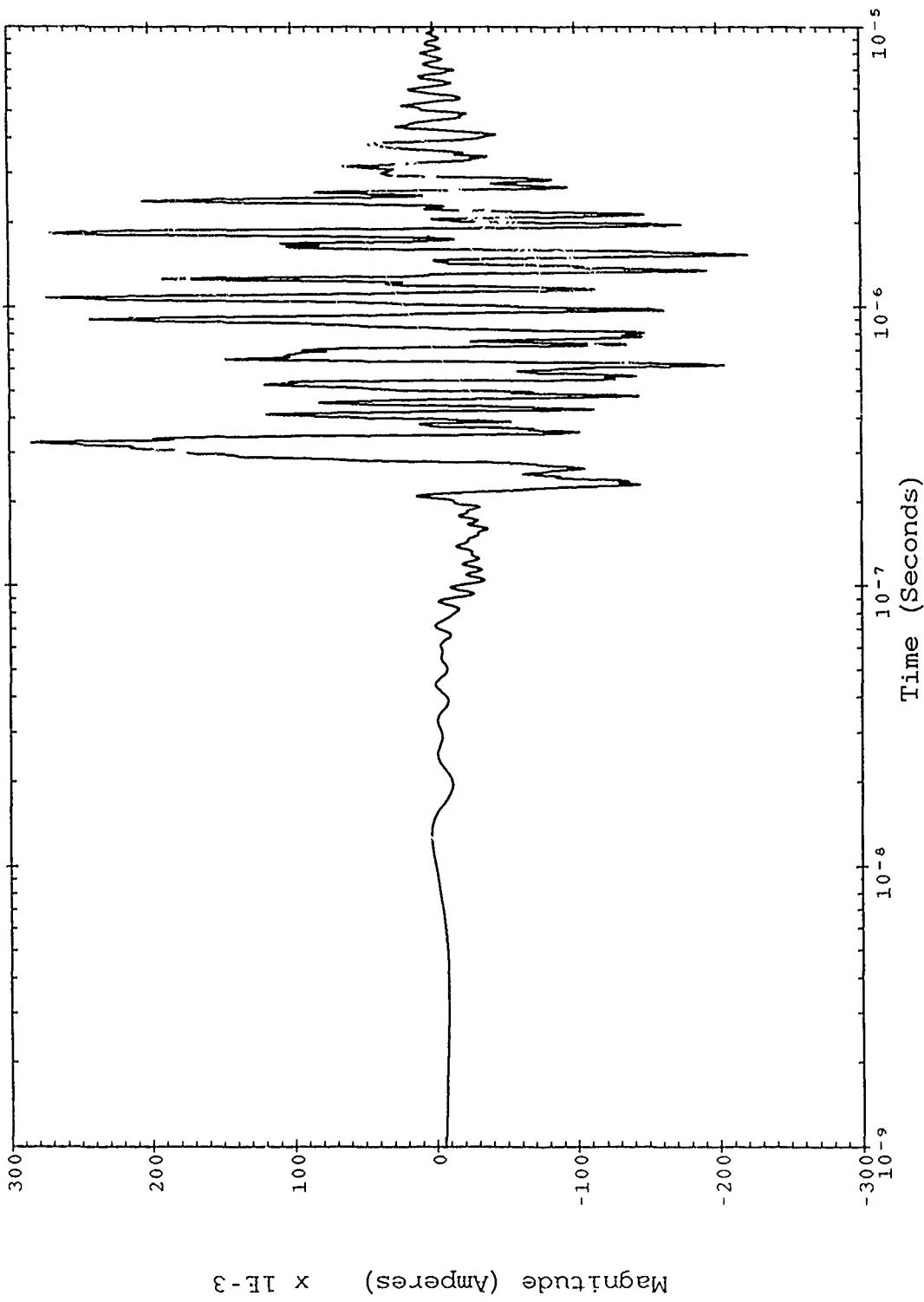


Figure B-464. Corrected TRESTLE data; TP 9406 SN 2421.

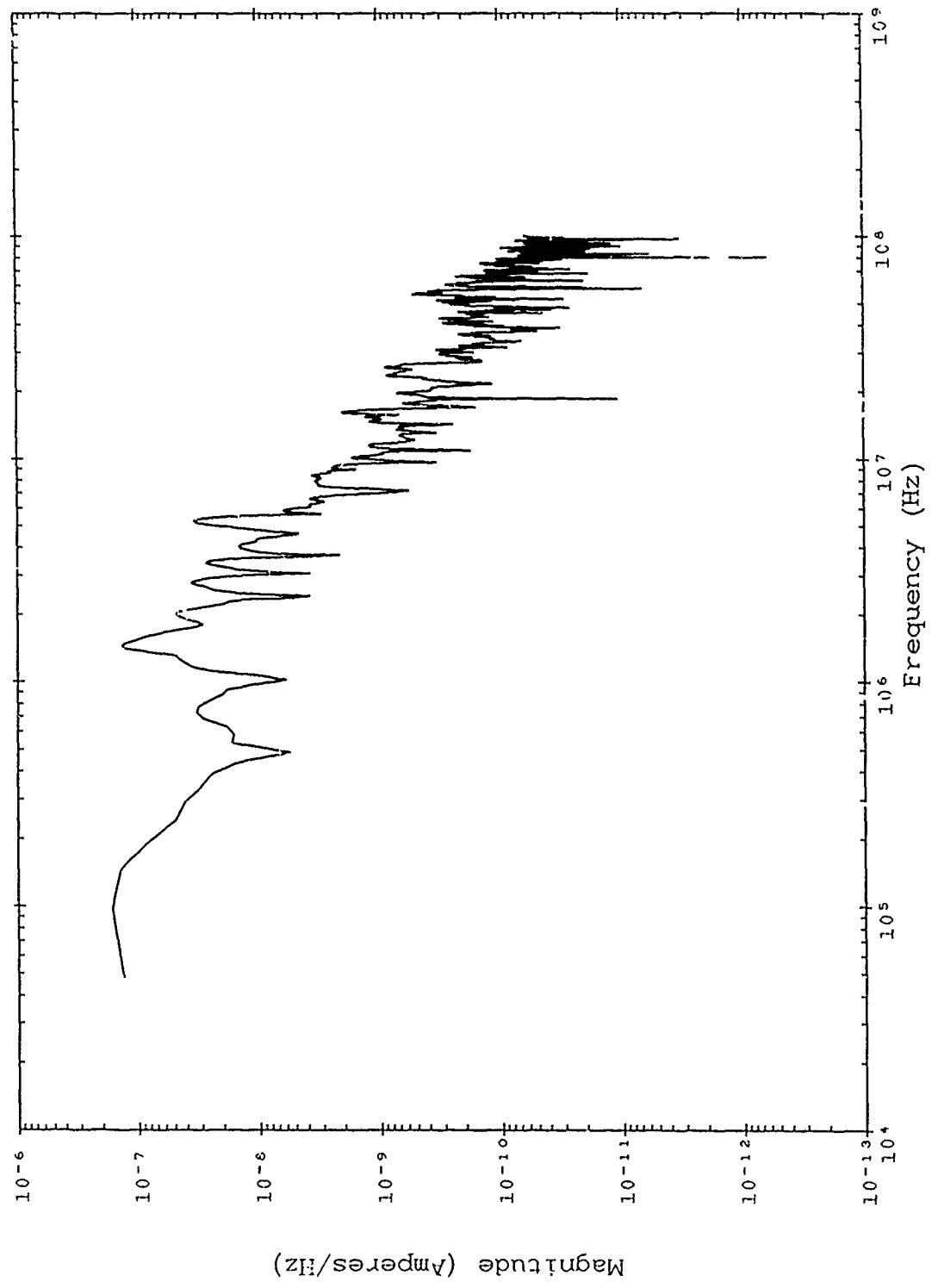


Figure B-465. Severe nearby lightning threat; TP 9406 SN 2421.

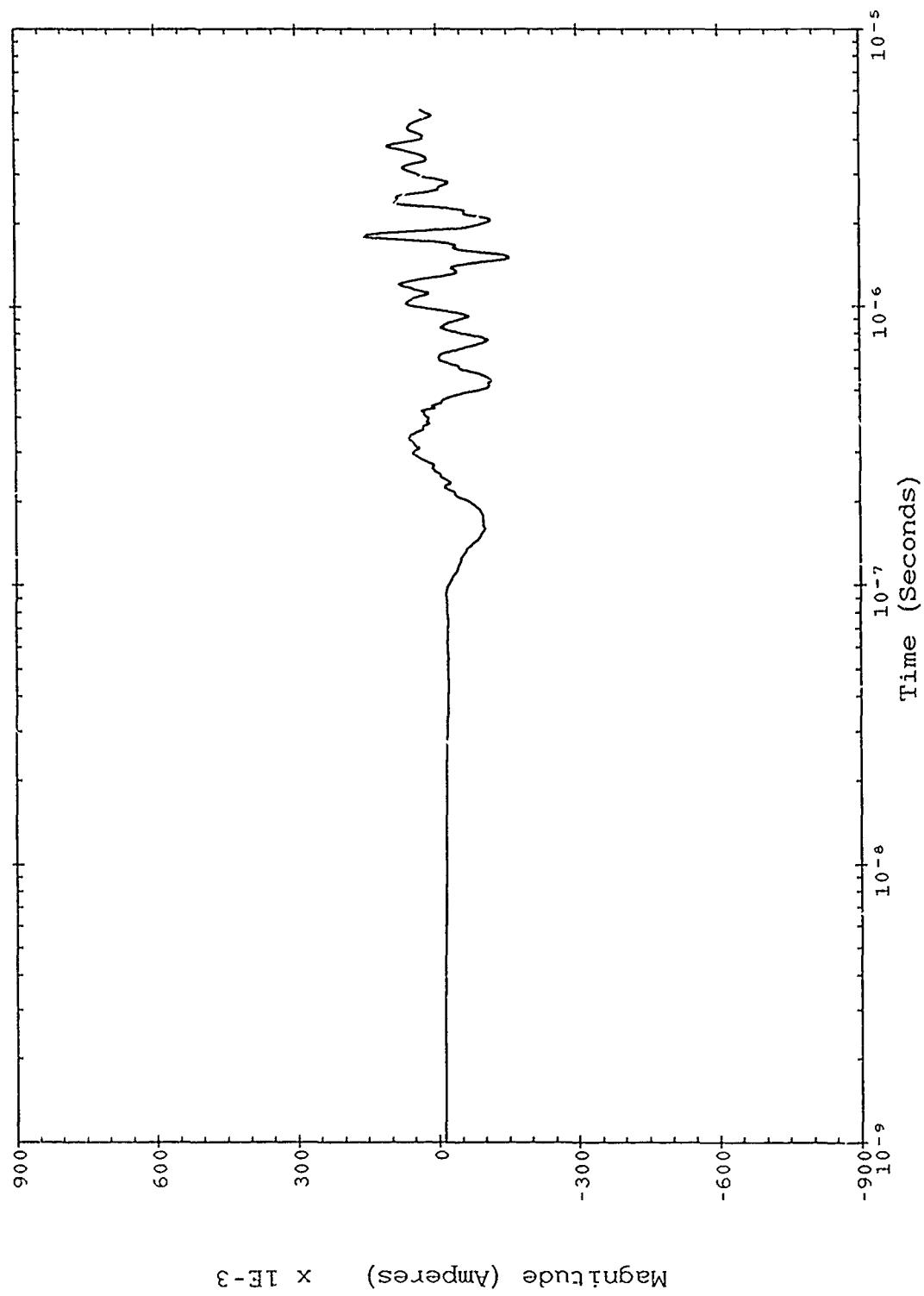


Figure B-466. Severe nearby lightning threat; TP 9406 SN 2421.

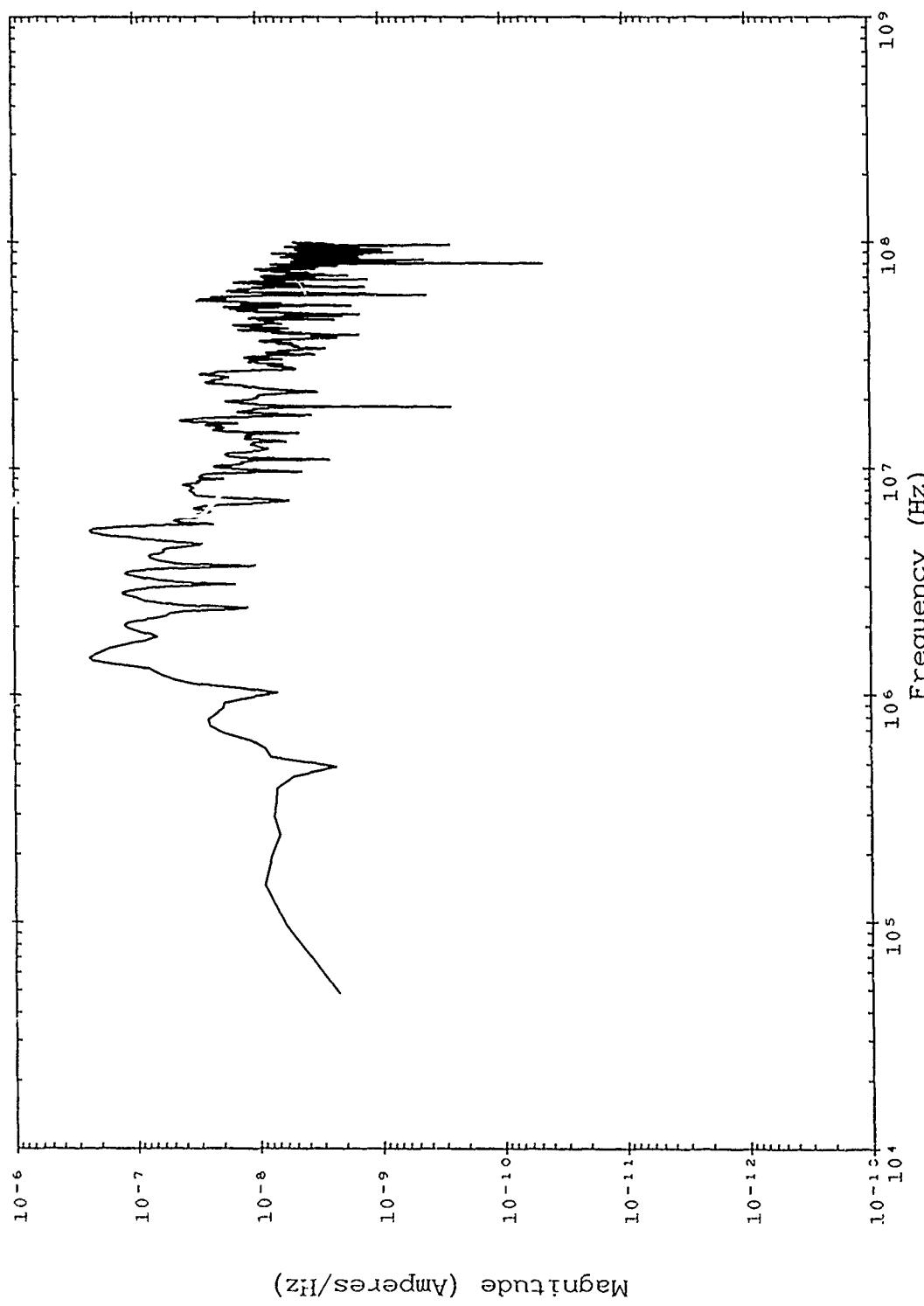


Figure B-467. Double exponential threat; TP 9406 SN 2421.

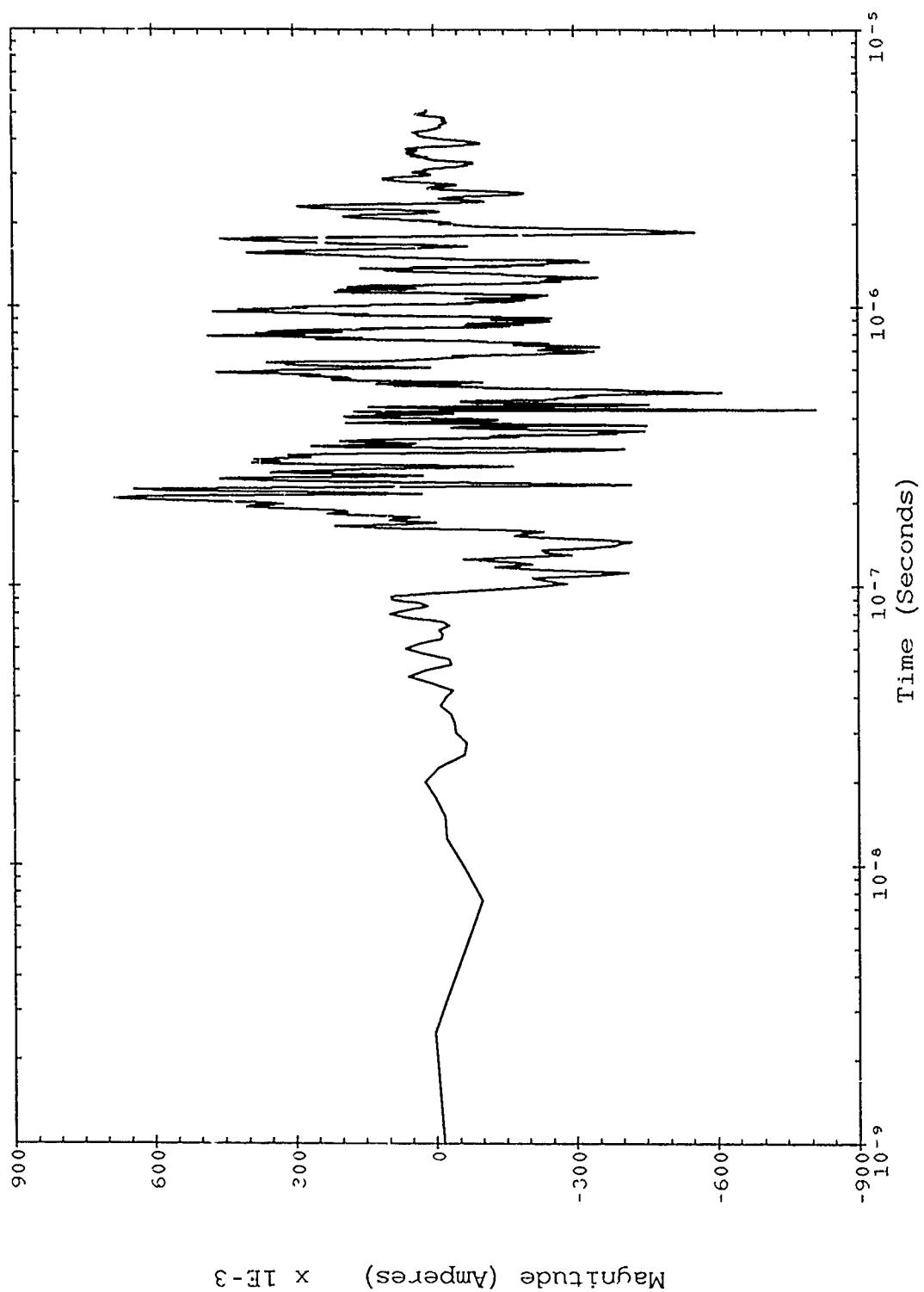


Figure B-468. Double exponential threat; TP 9406 SN 2421.

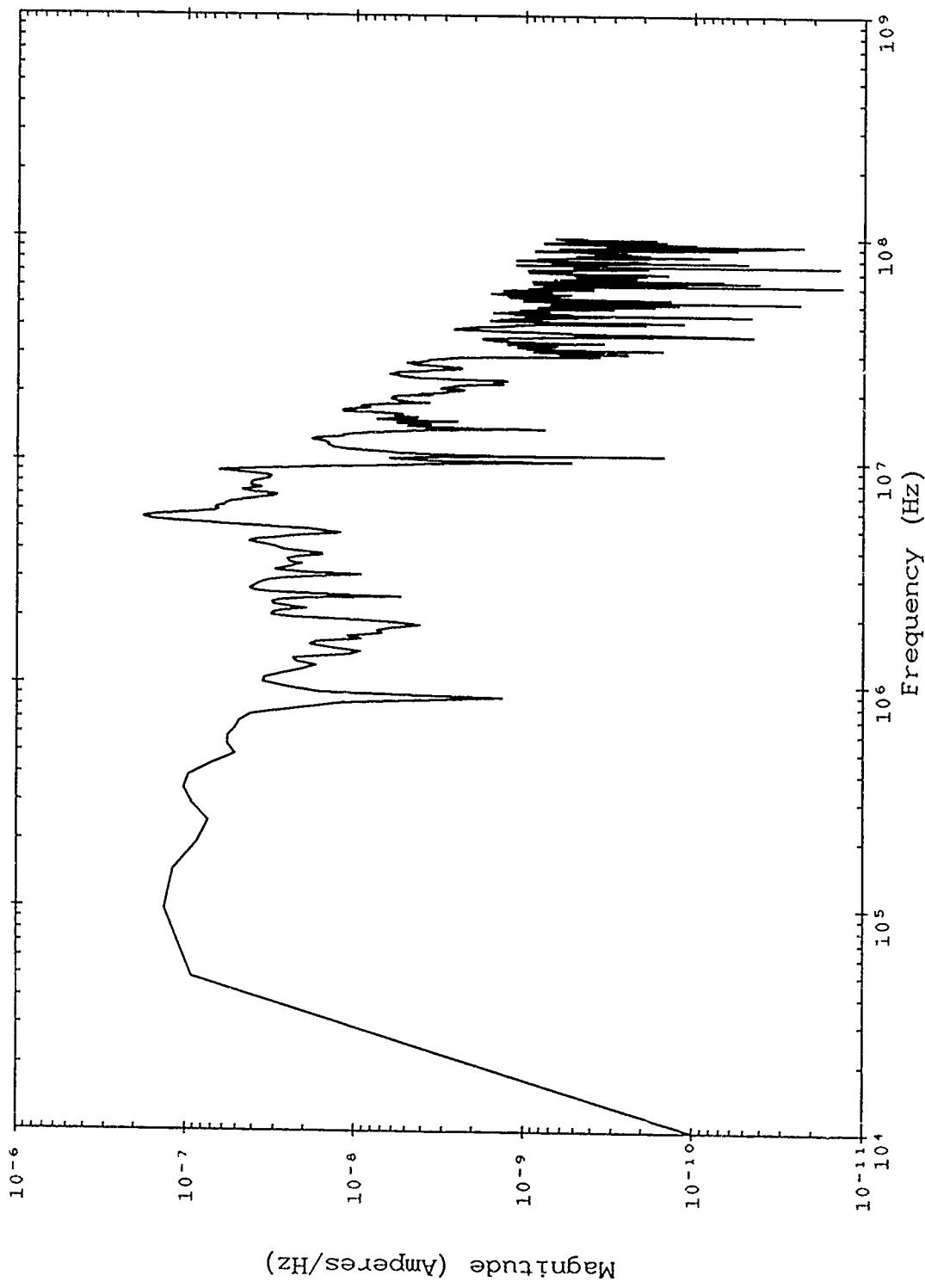


Figure B-469. Corrected TRESTLE data; TP 94t1 SN 2628.

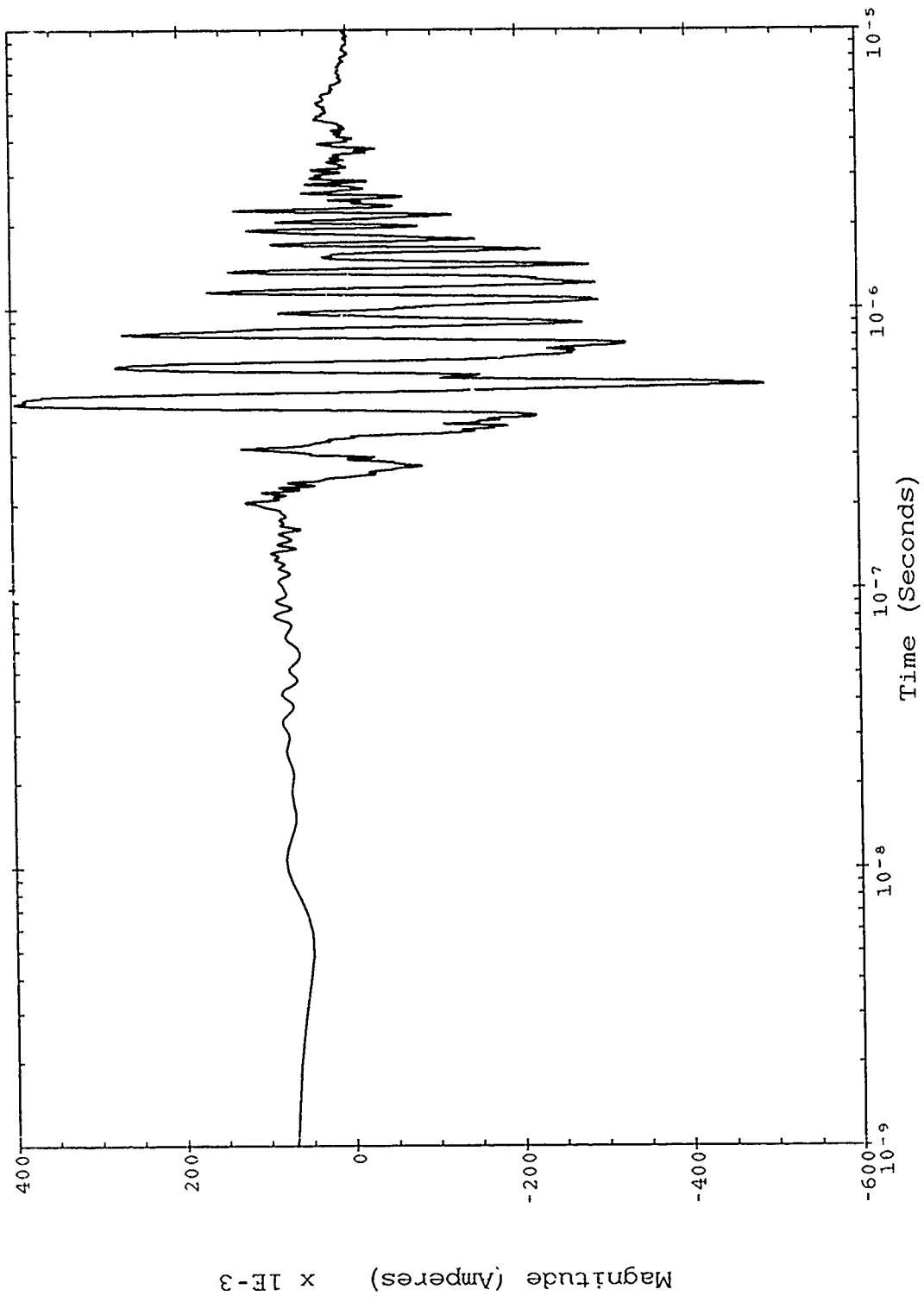


Figure B-470. Corrected TRESTLE data; RP 9461 SN 2628.

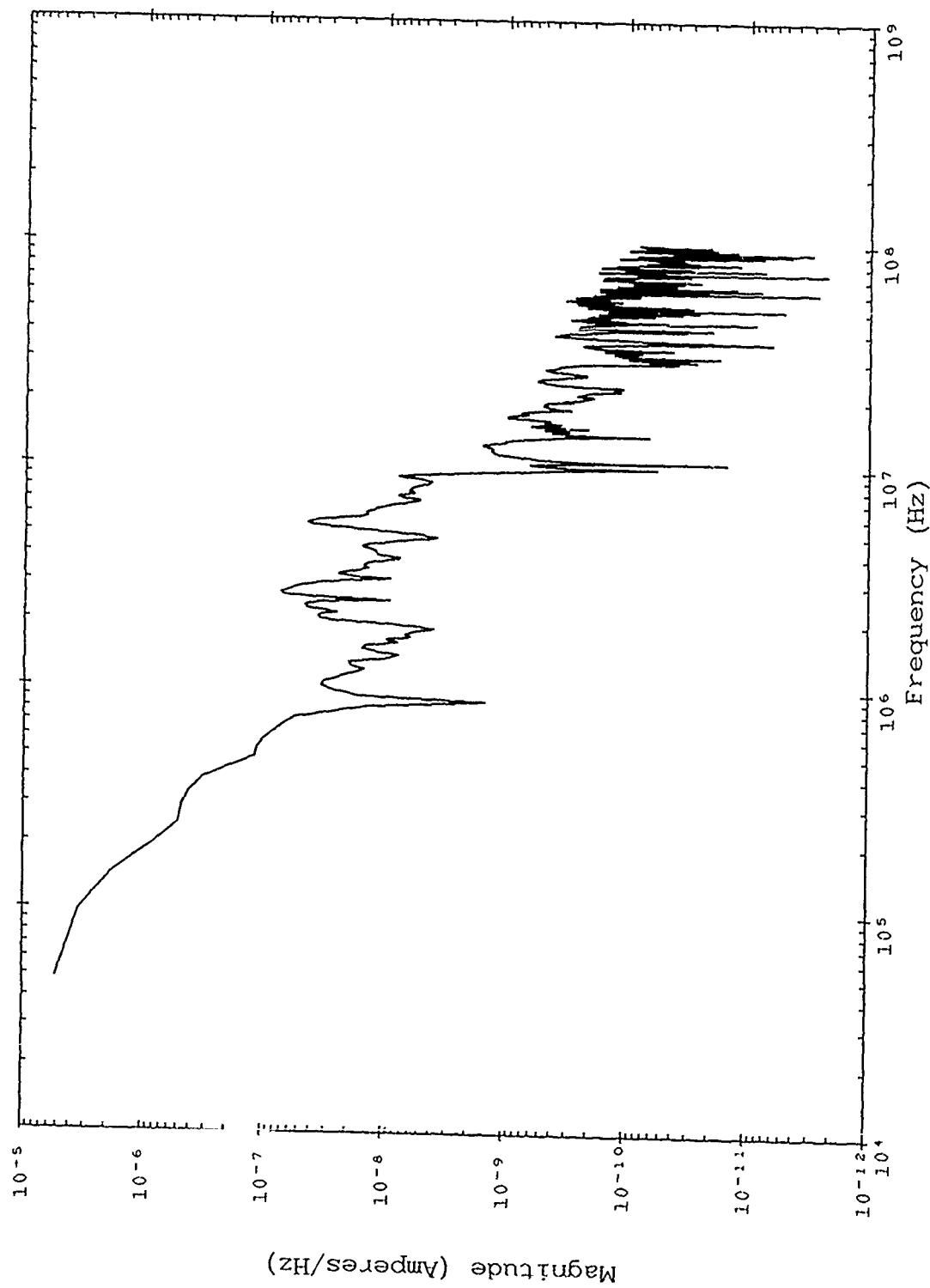


Figure B-471. Severe nearby lightning threat; TP 9461 SN 2628.

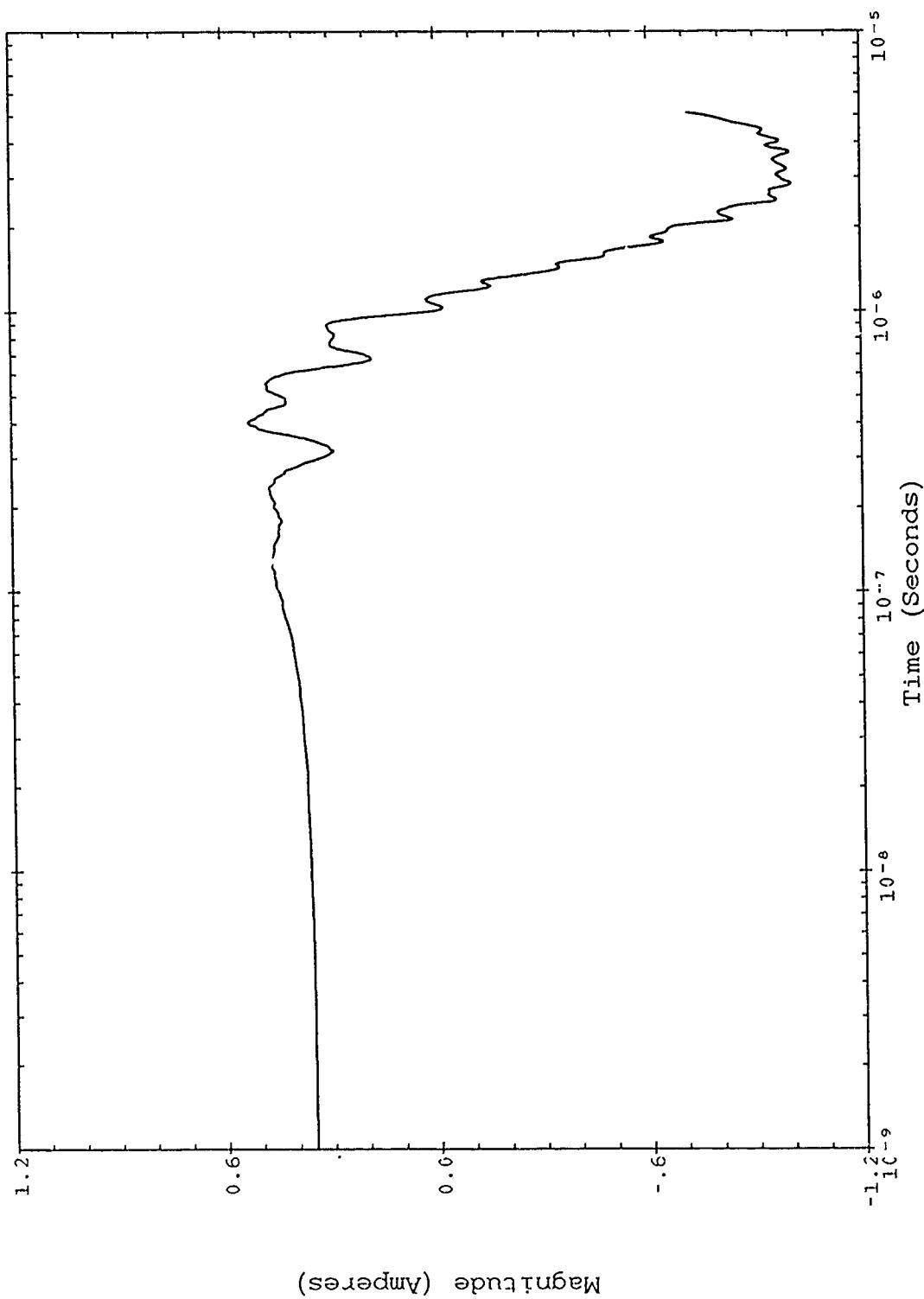


Figure B-472. Severe nearby lightning threat; TP 9461 SN 2628.

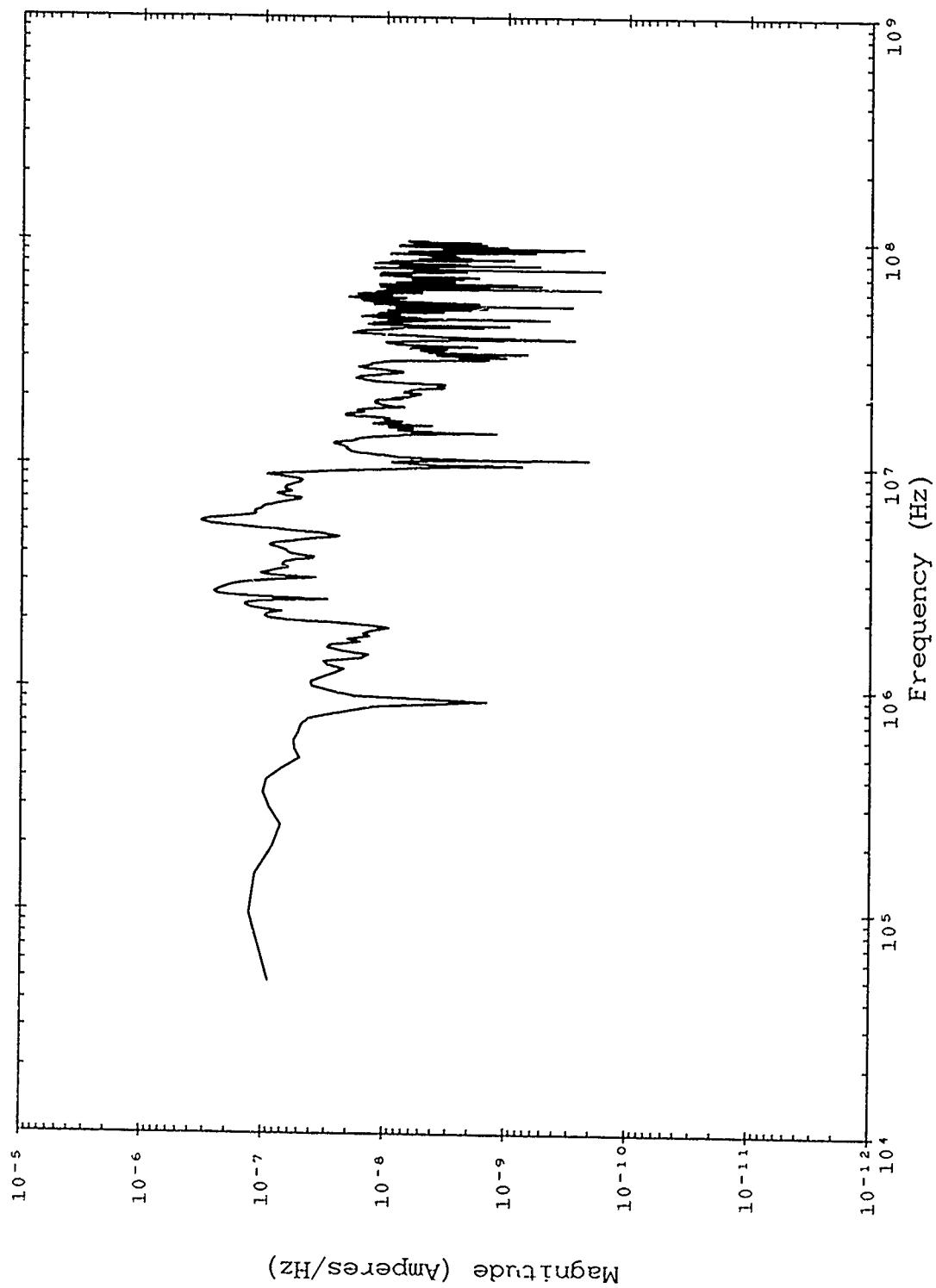


Figure B-473. Double exponential threat; TP 9461 SN 2628.

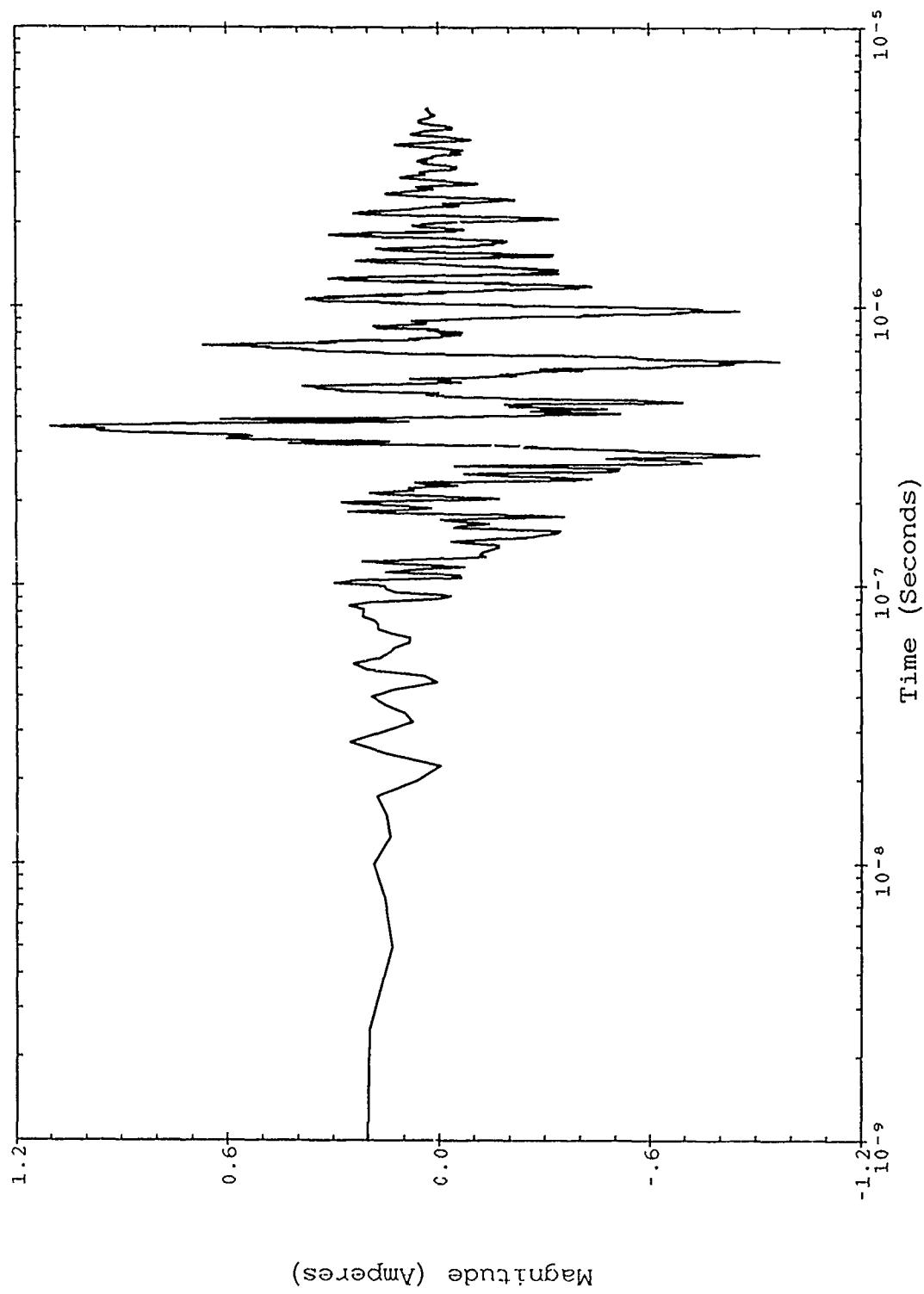


Figure B-474. Double exponential threat; TP 9461 SN 2628.

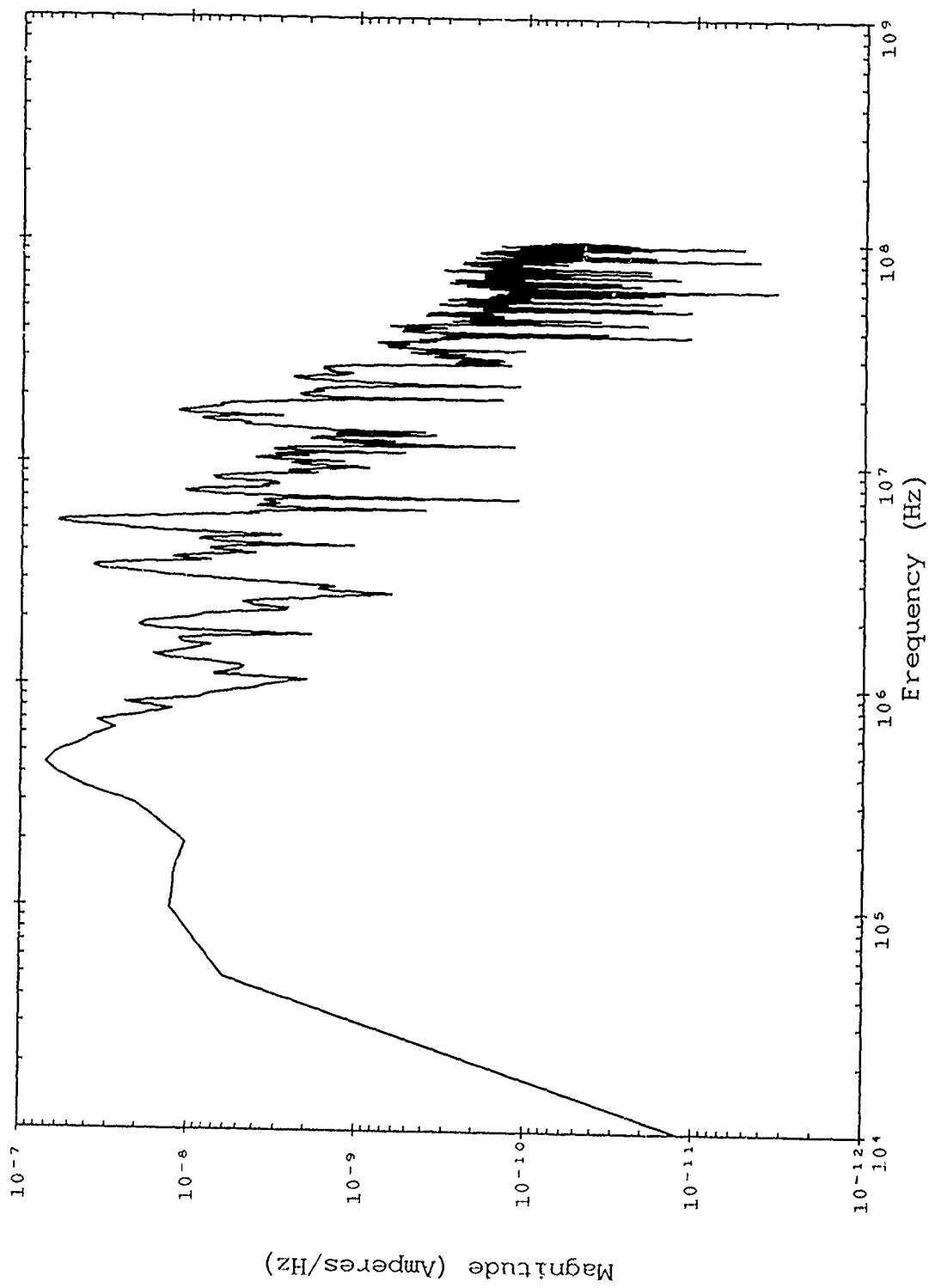


Figure B-475. Corrected TRESTLE data; TP 9470 SN 1684.

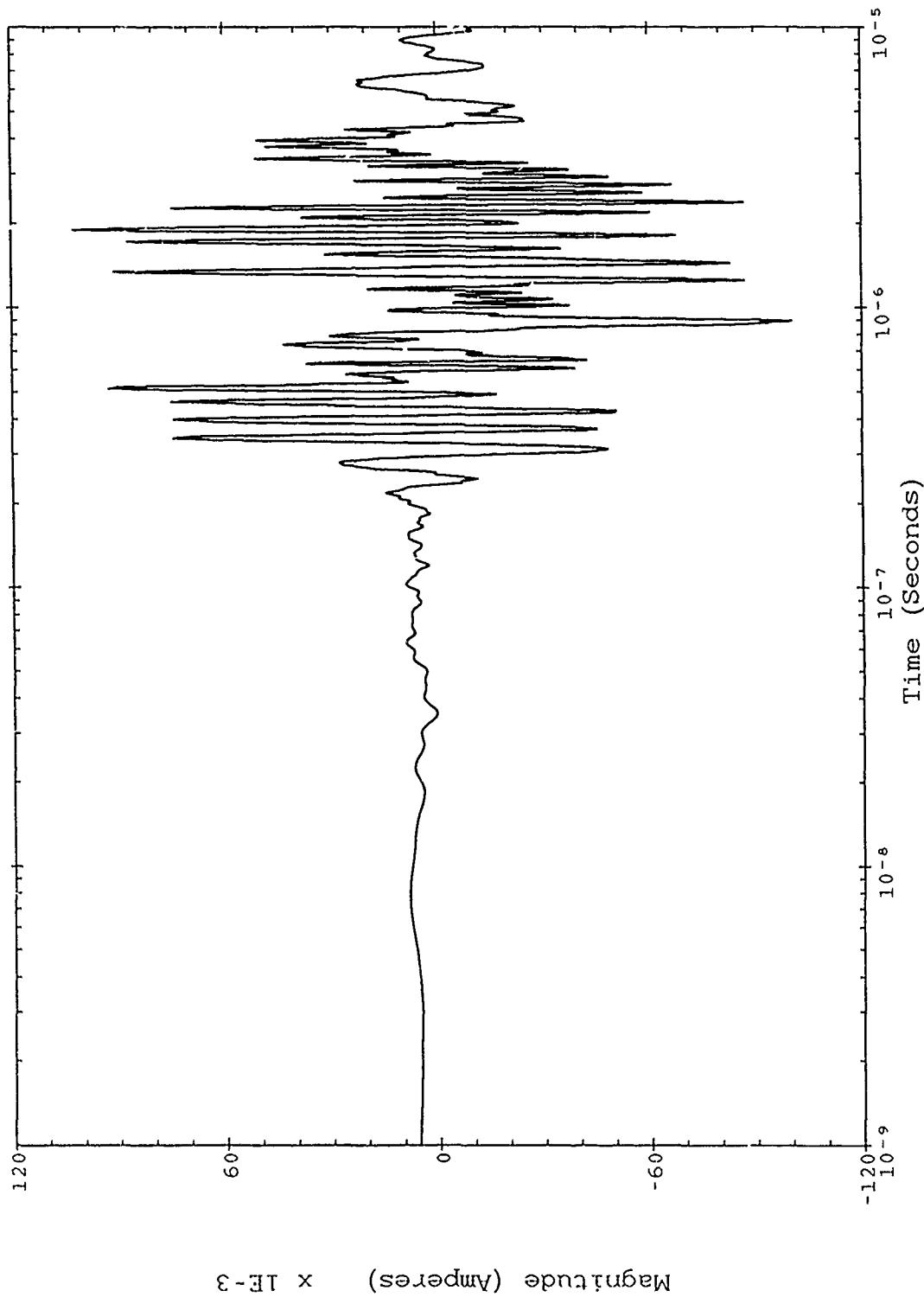


Figure B-476. Corrected TRESTLE data; TP 9470 SN 1684.

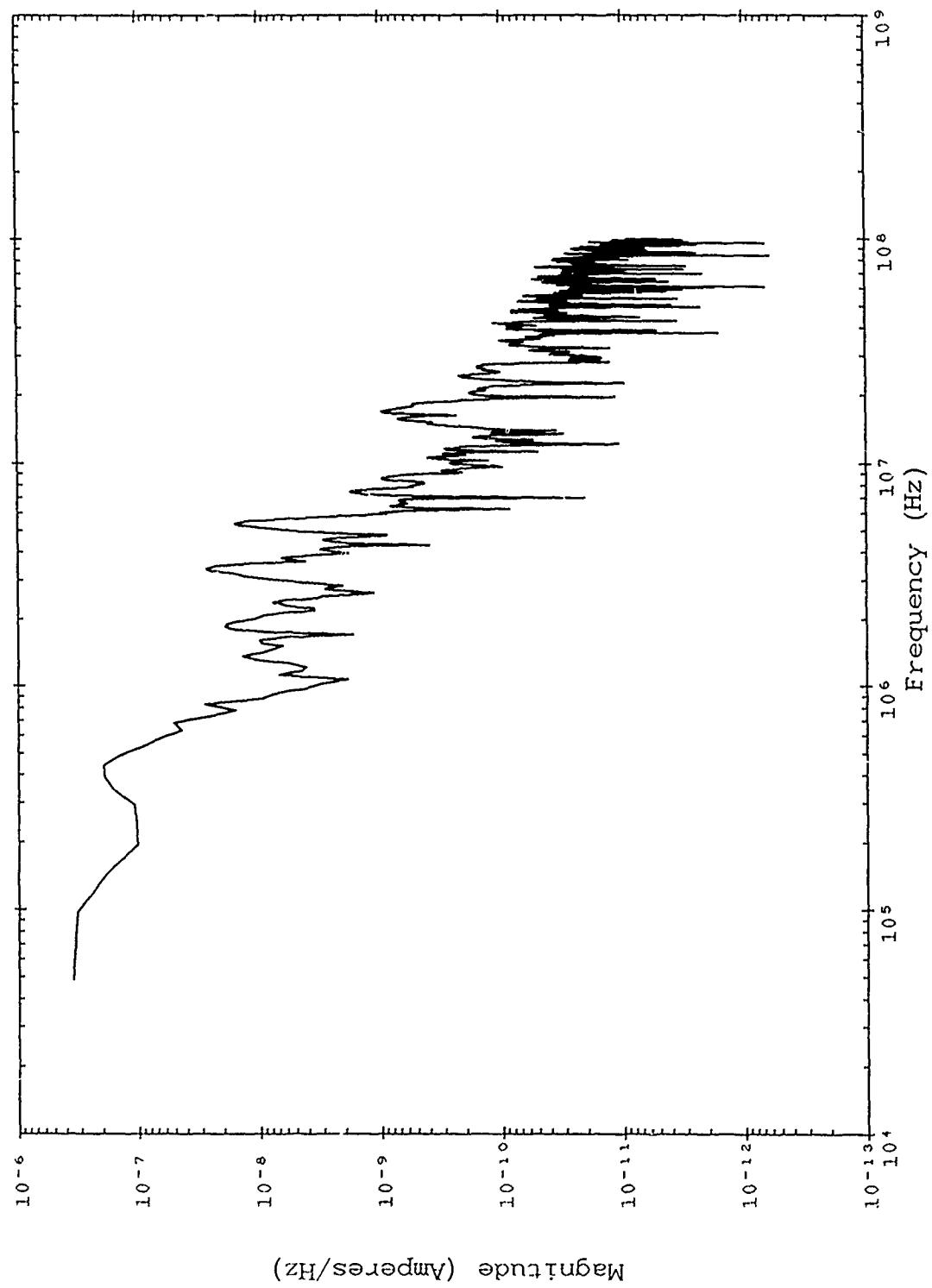


Figure B-477. Severe nearby lightning threat; TP 9470 SN 1684.

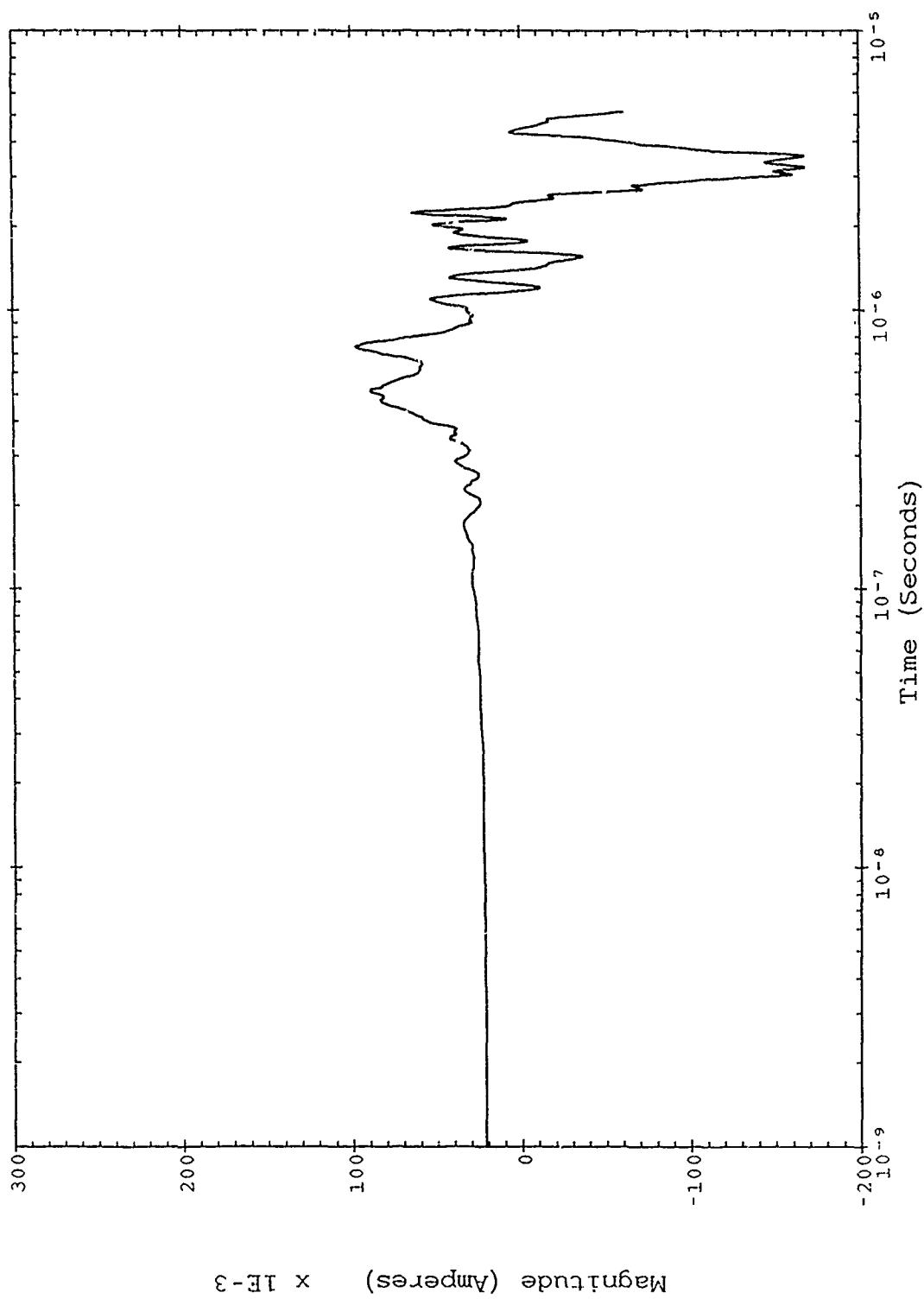


Figure B-478. Severe nearby lightning threat; TP 947C SN 1684.

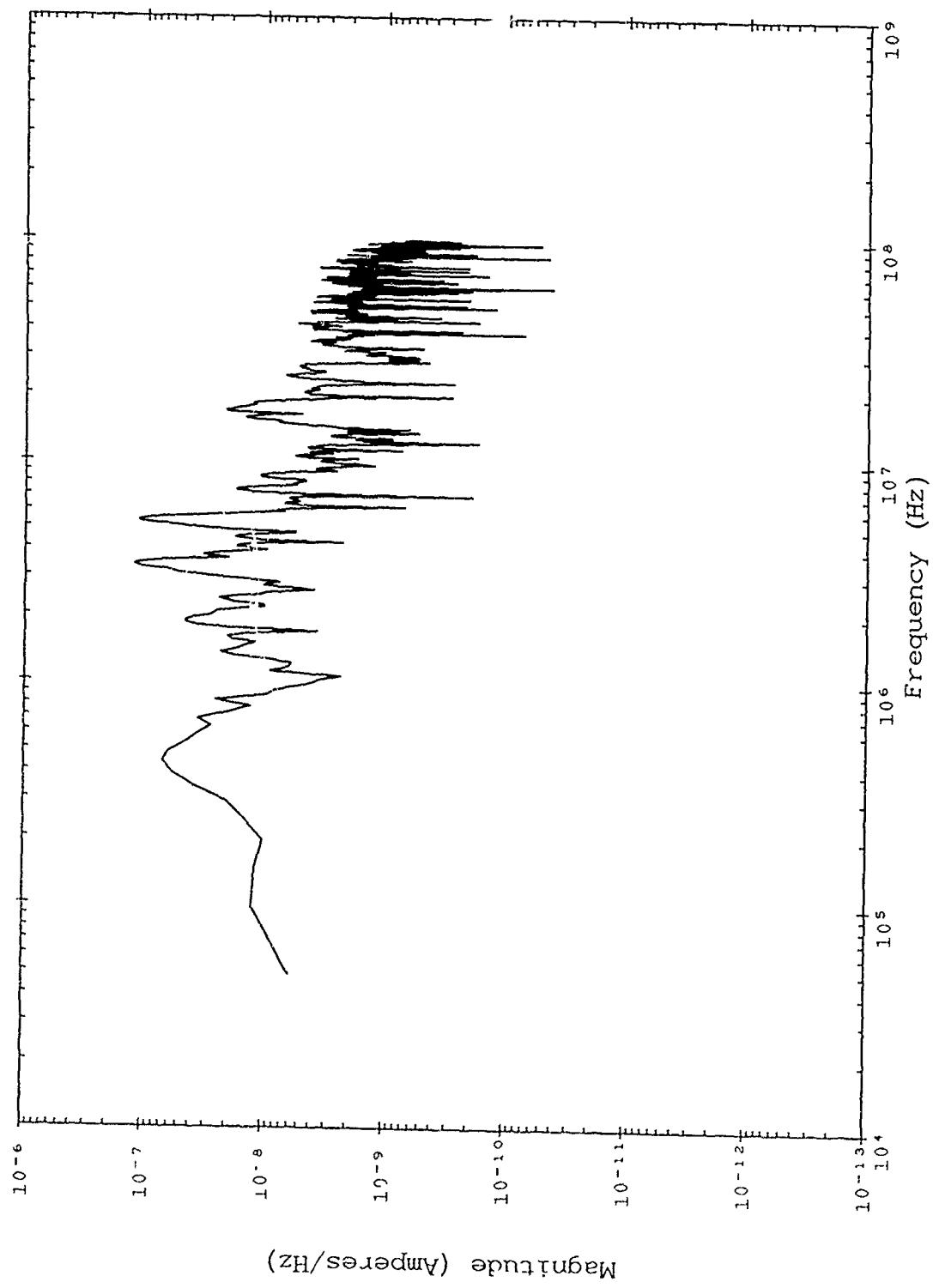


Figure B-479. Double exponential threat; TP 9470 SN 1684.

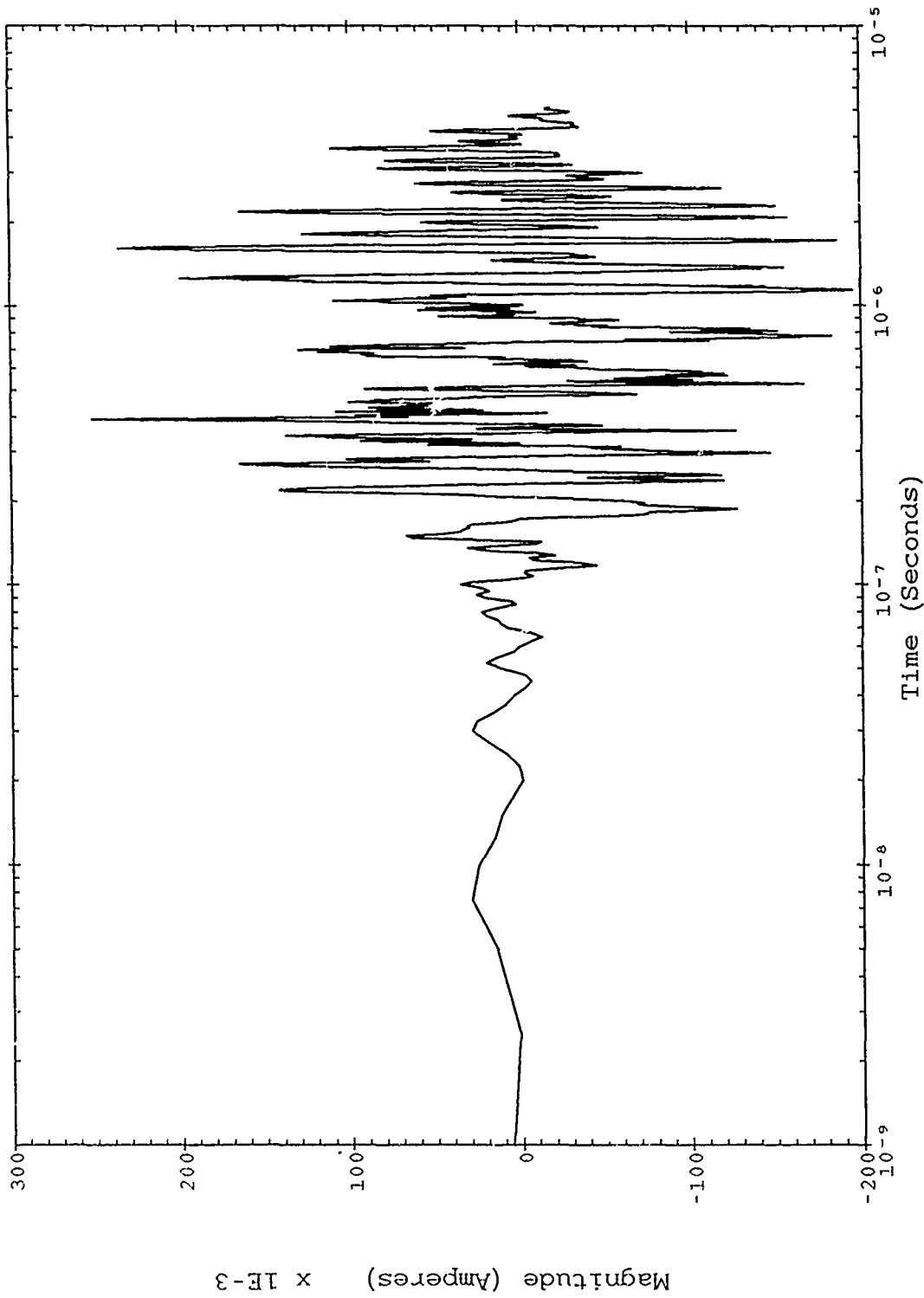


Figure B-480. Double exponential threat; TP 9470 SN 1684.

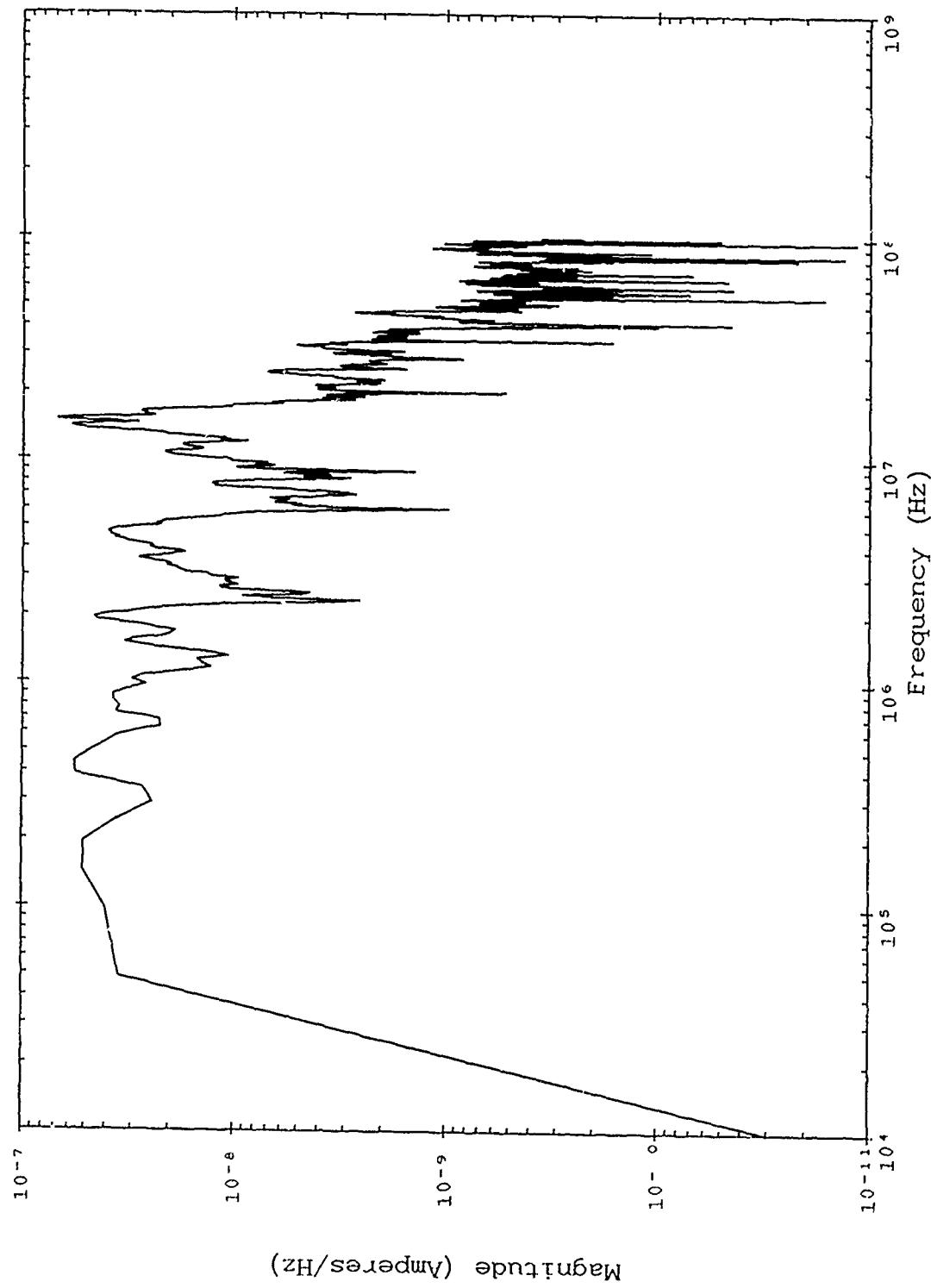


Figure B-481. Corrected TRESTLE data; TP 9513 SN 2618.

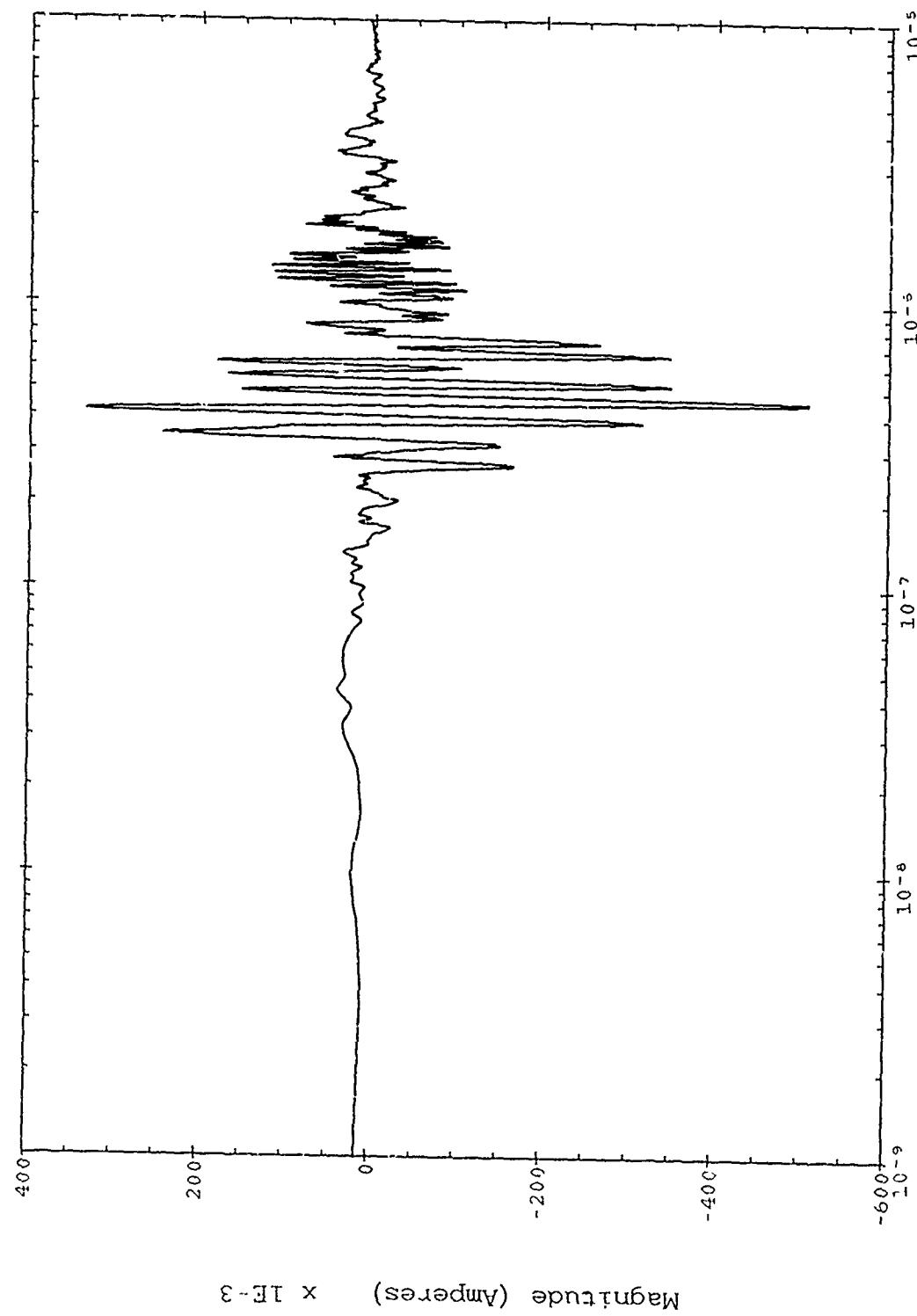


Figure B-482. Corrected TRESTLE data; TP 9513 SN 2618.

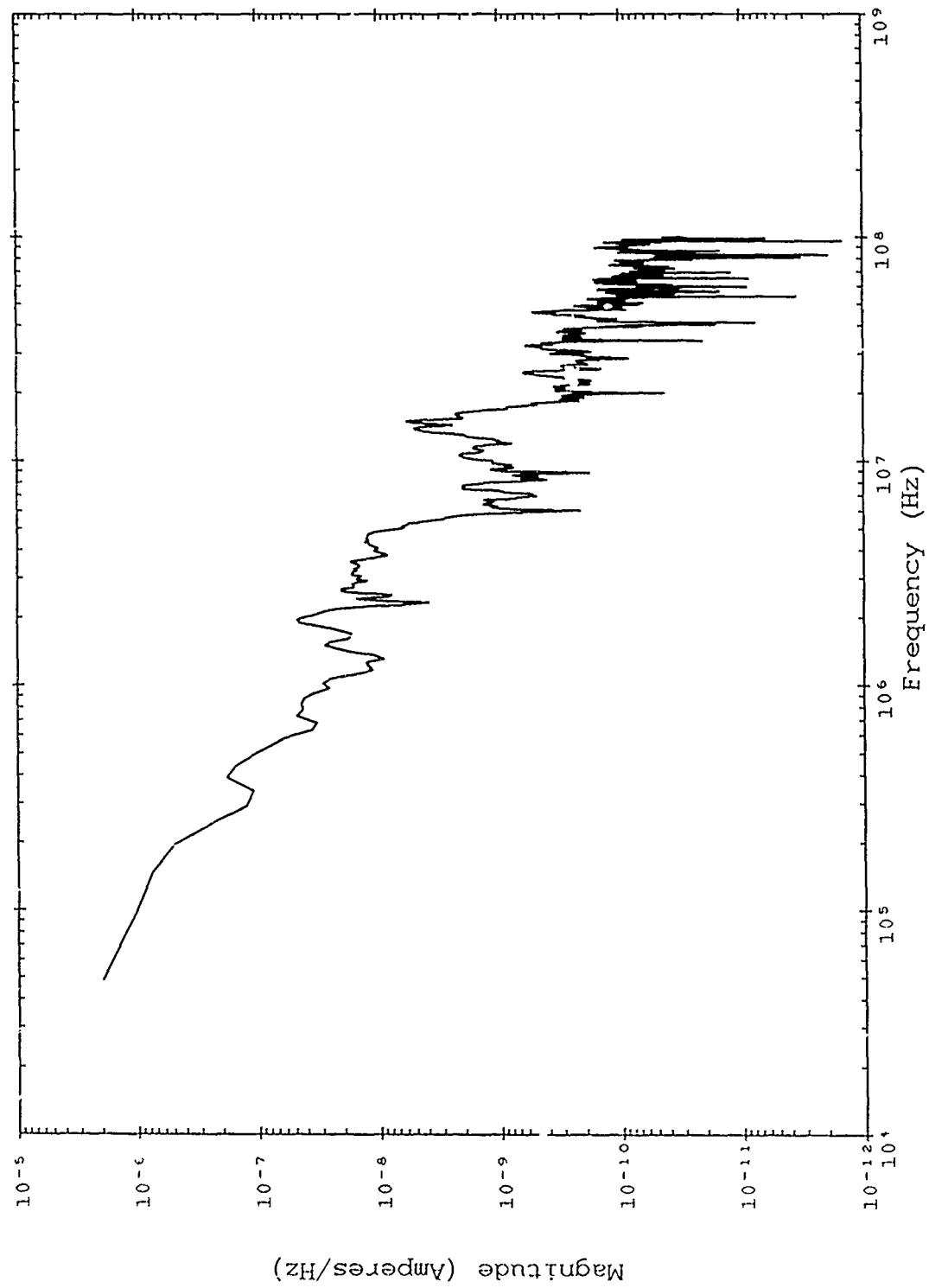


Figure B-483. Severe nearby lightning threat; TP 9513 SN 2618.

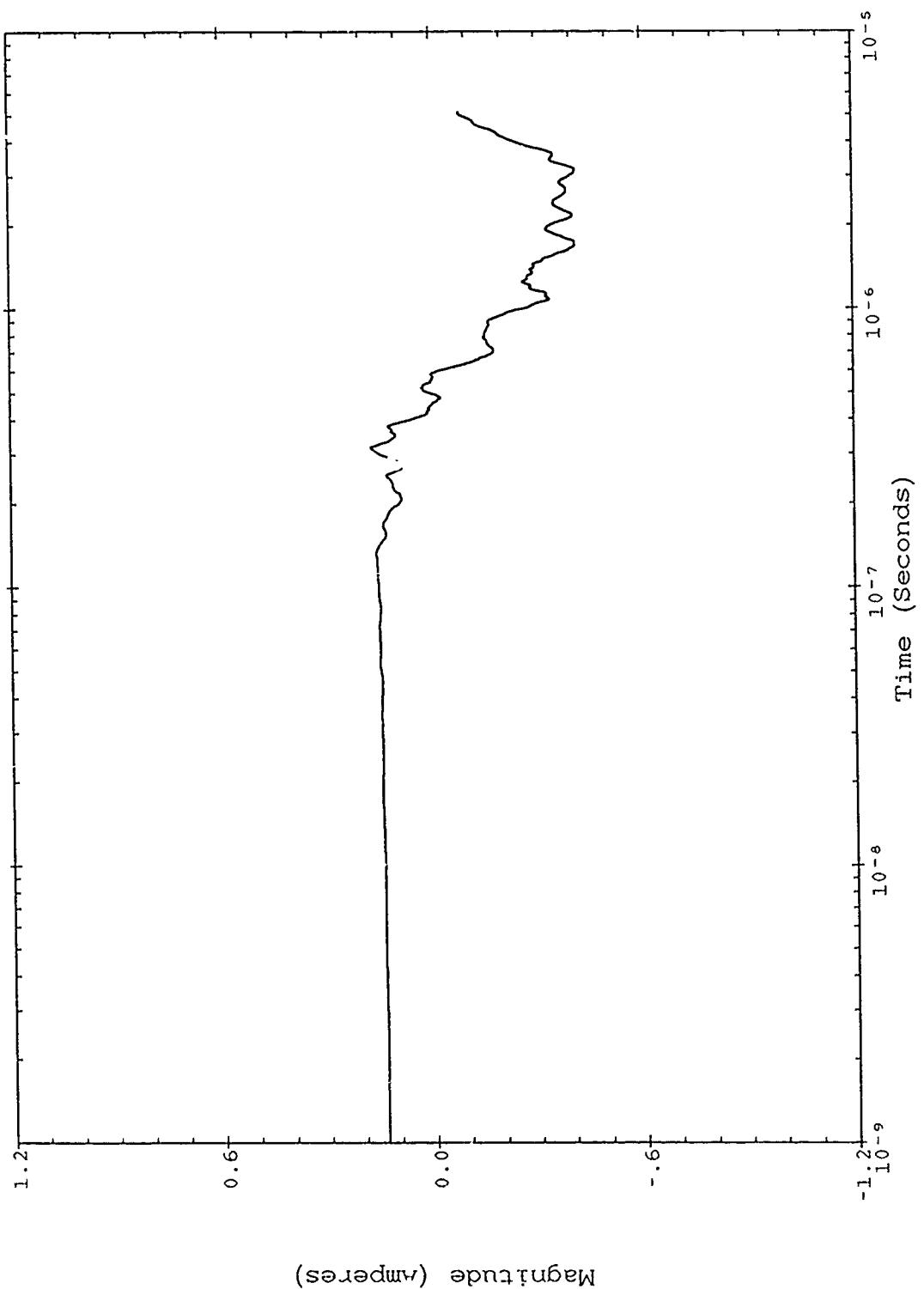


Figure B-484. Severe nearby lightning threat; TP 9513 SN 2618.

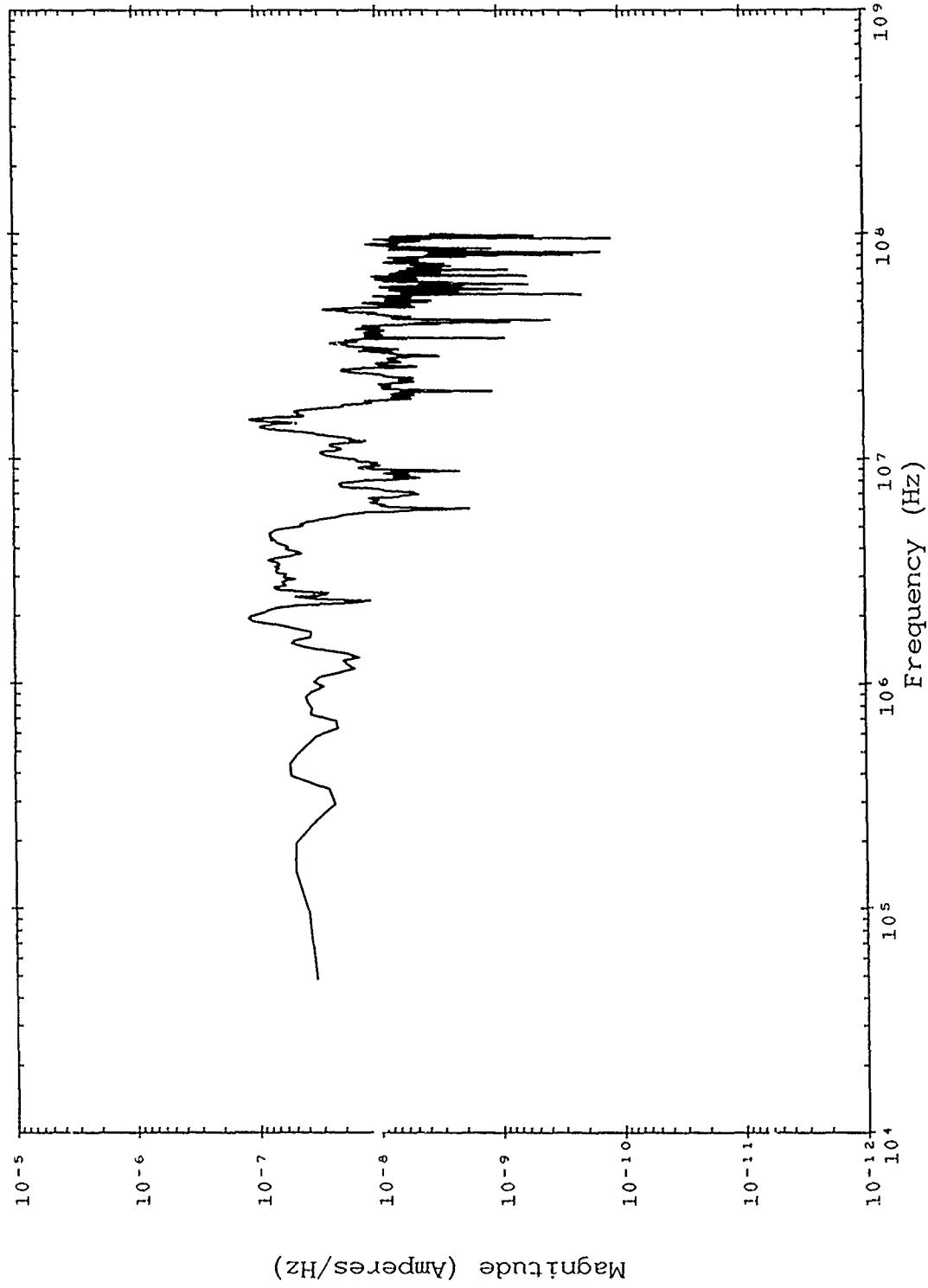


Figure B-485. Double exponential threat; TP 9513 SN 2618.

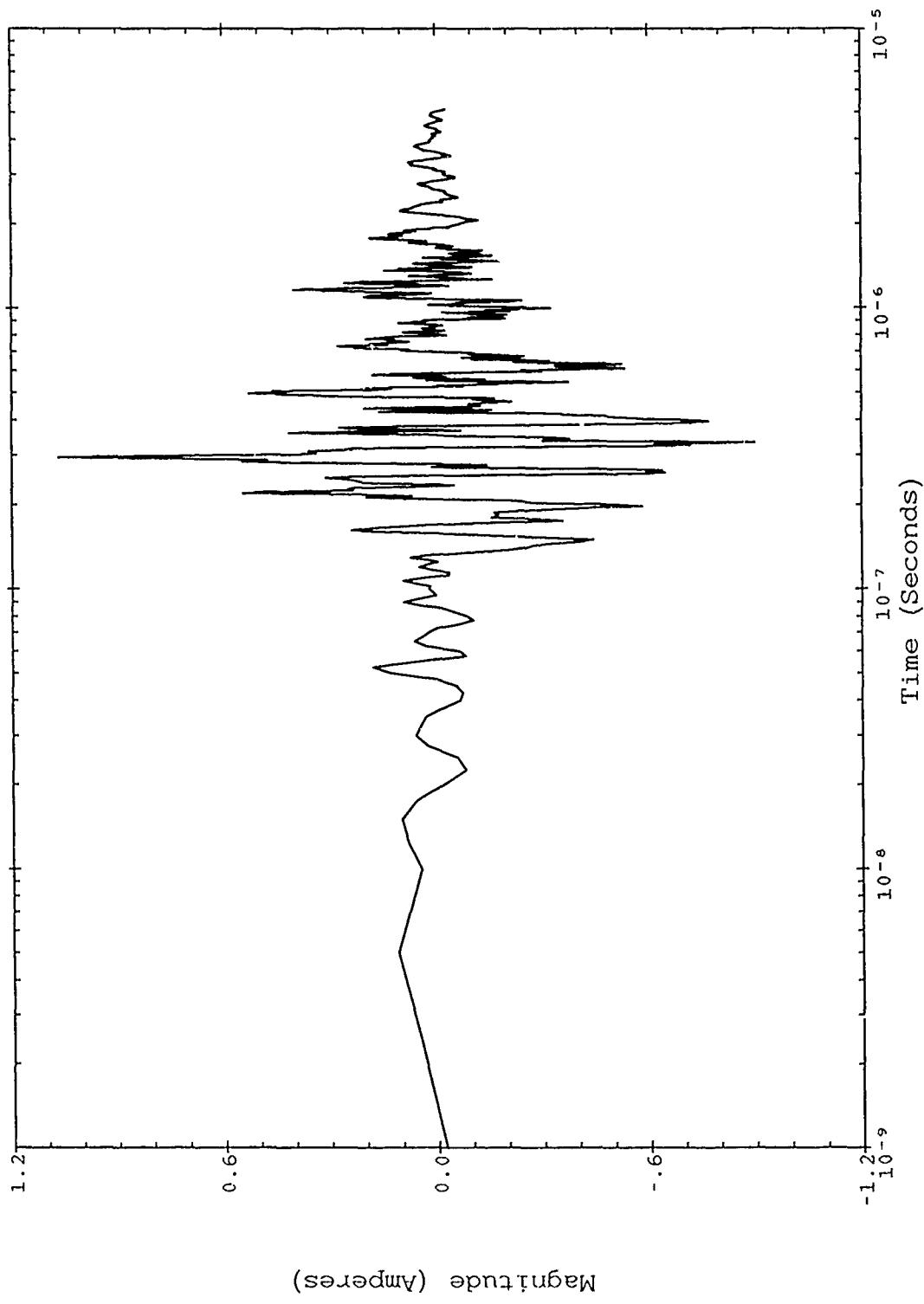


Figure B-486. Double exponential threat; TP 9513 SN 2618.

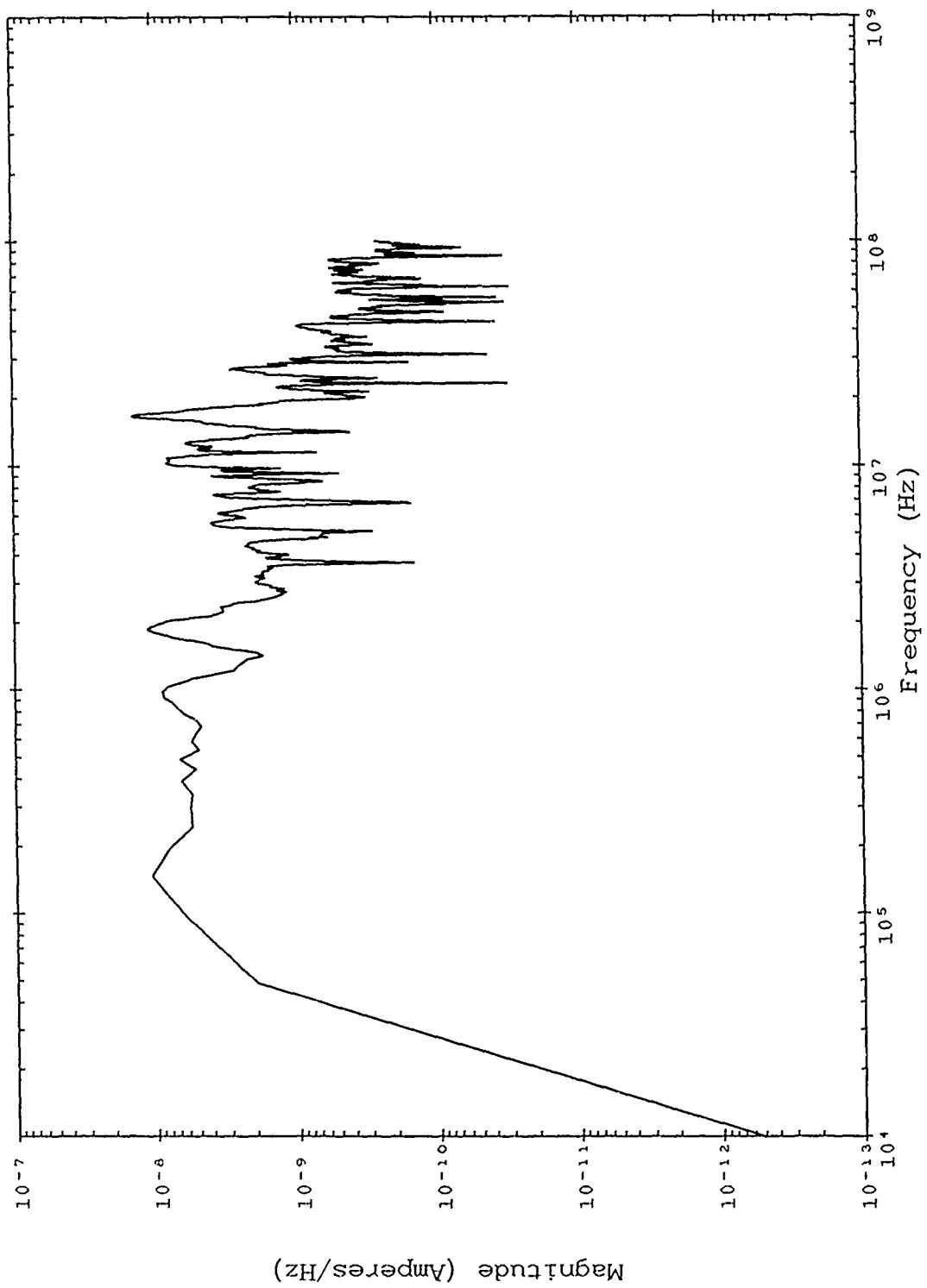


Figure B-487. Corrected TRESTLE data; TP 9786 SN 2697.

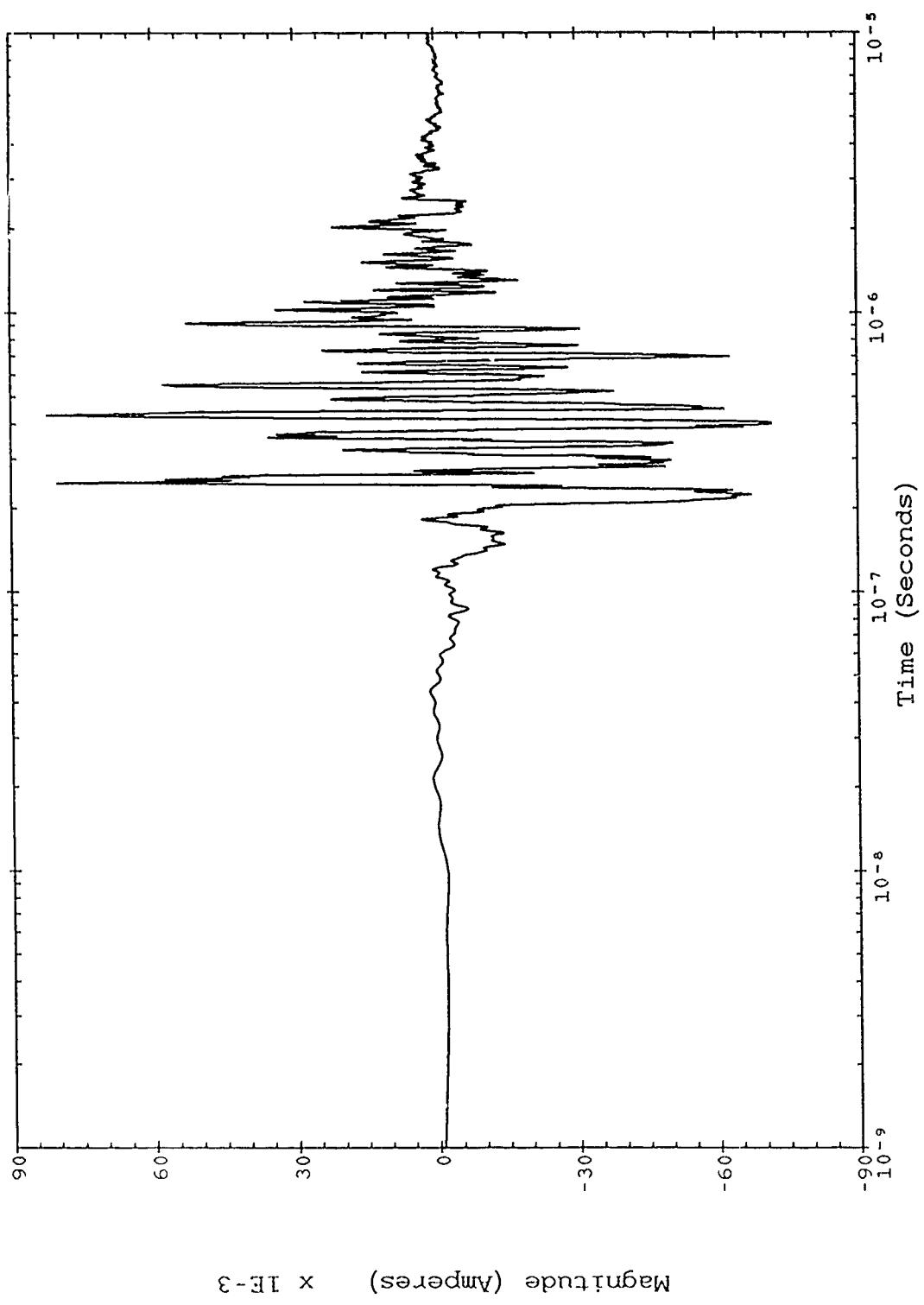


Figure B-488. Corrected TRESTLE data; TP 9786 SN 2697.

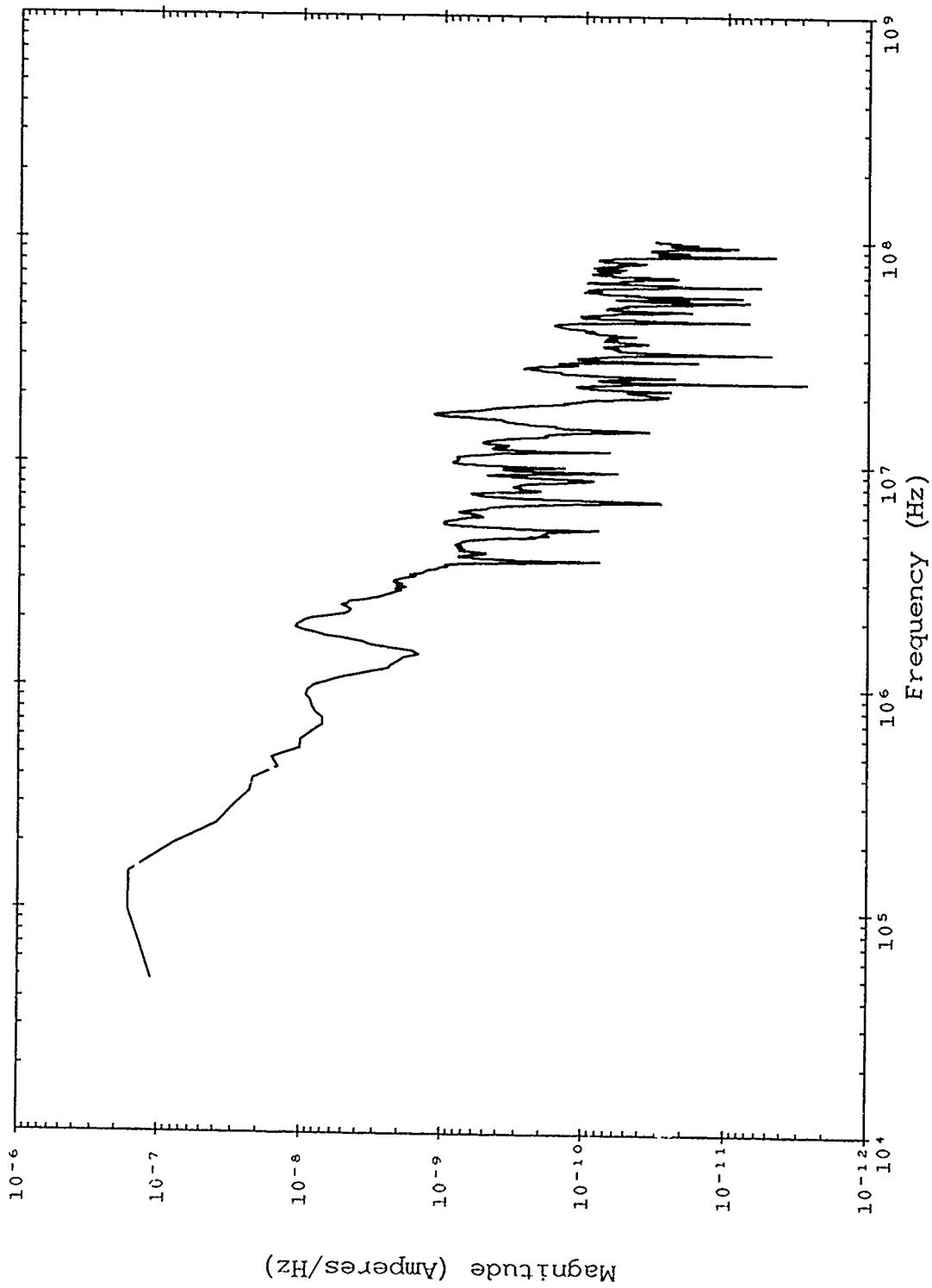


Figure B-489. Severe nearby lightning threat; TP 9786 SN 2697.

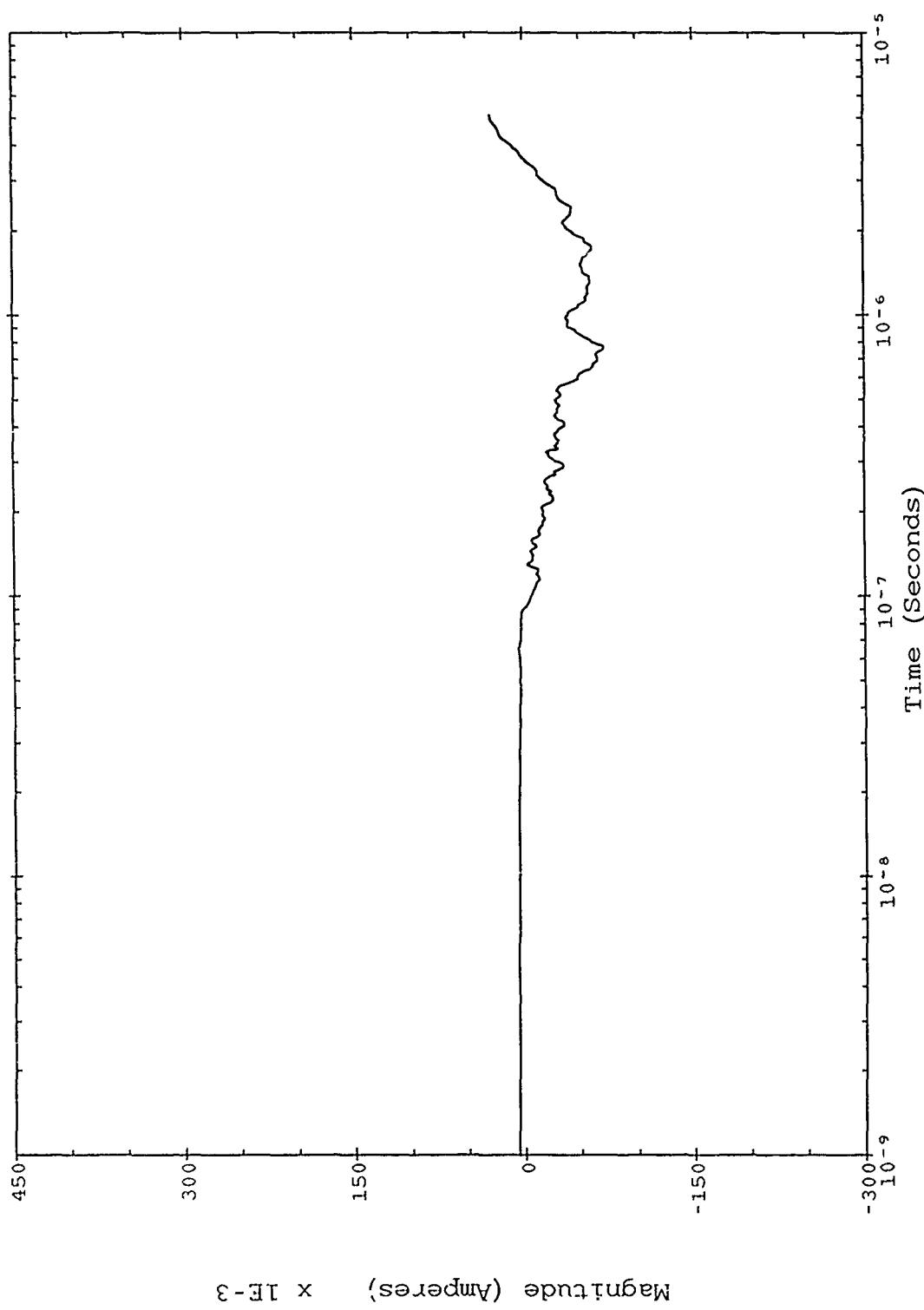


Figure B-490. Severe nearby lightning threat; TP 9786 SN 2697.

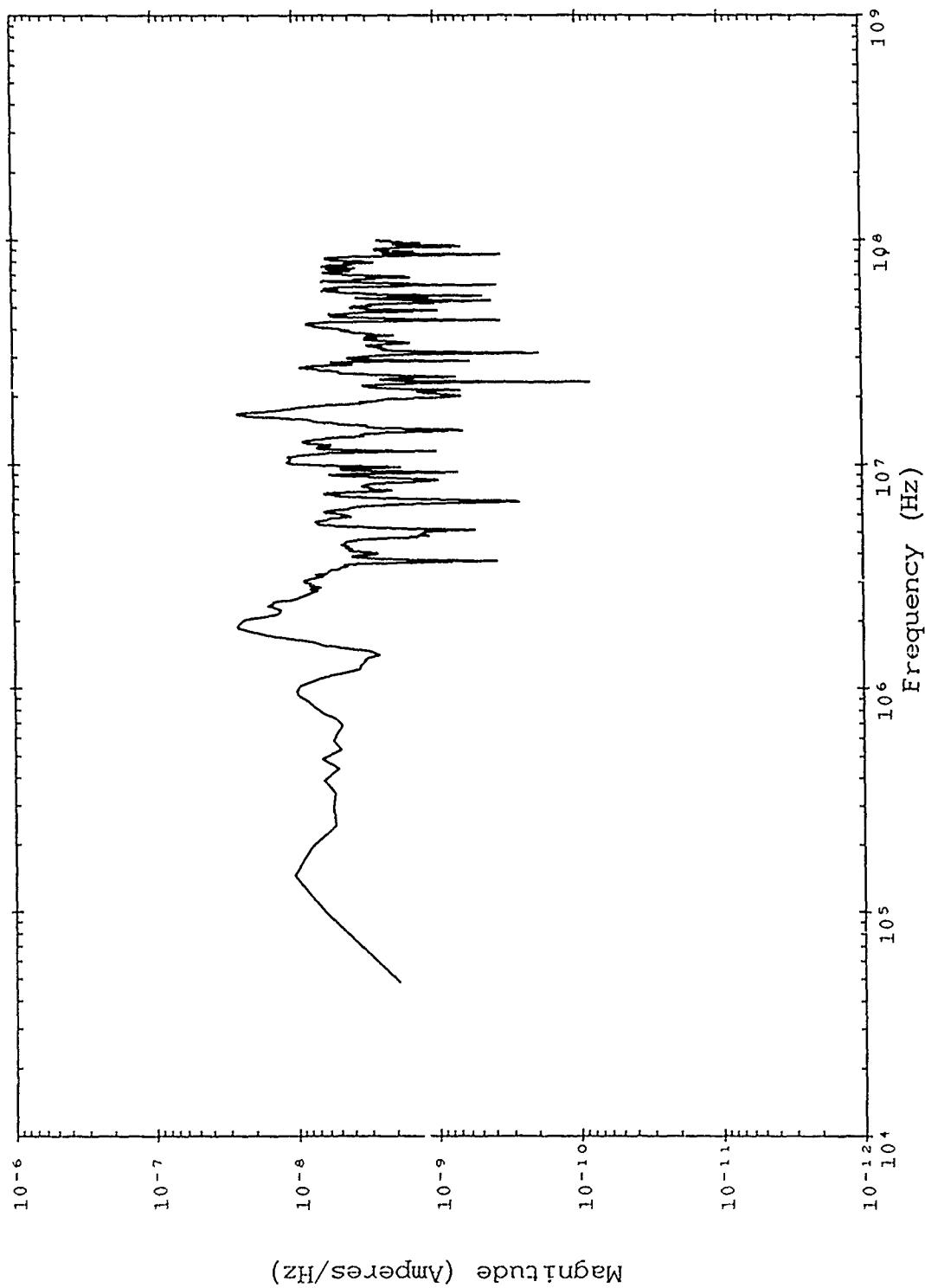


Figure B-491. Double exponential threat; TP 9786 SN 2697.

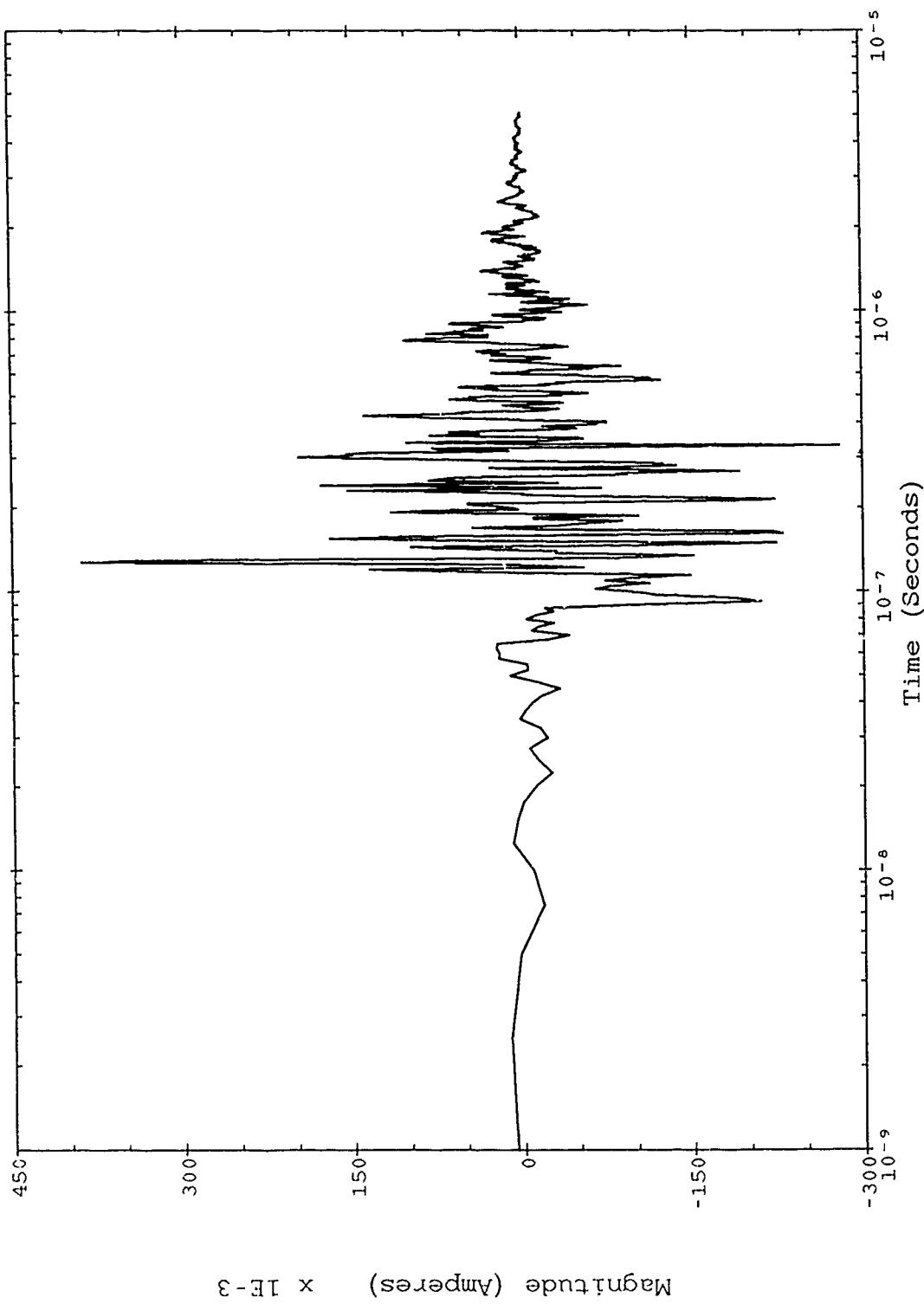


Figure B-492. Double exponential threat; TP 9786 SN 2697.

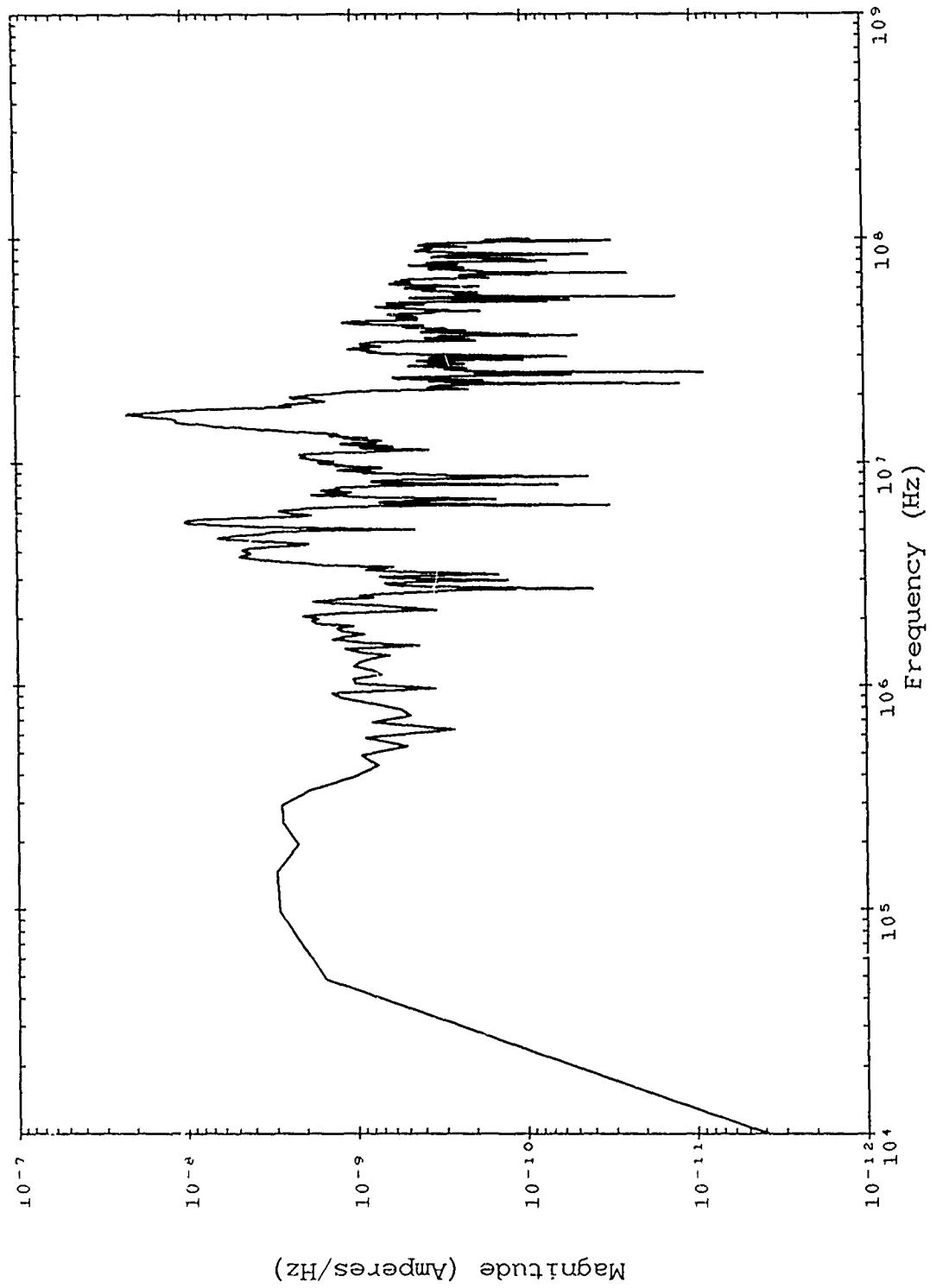


Figure B-493. Corrected TRESTLE data; TP 9893 SN 2551.

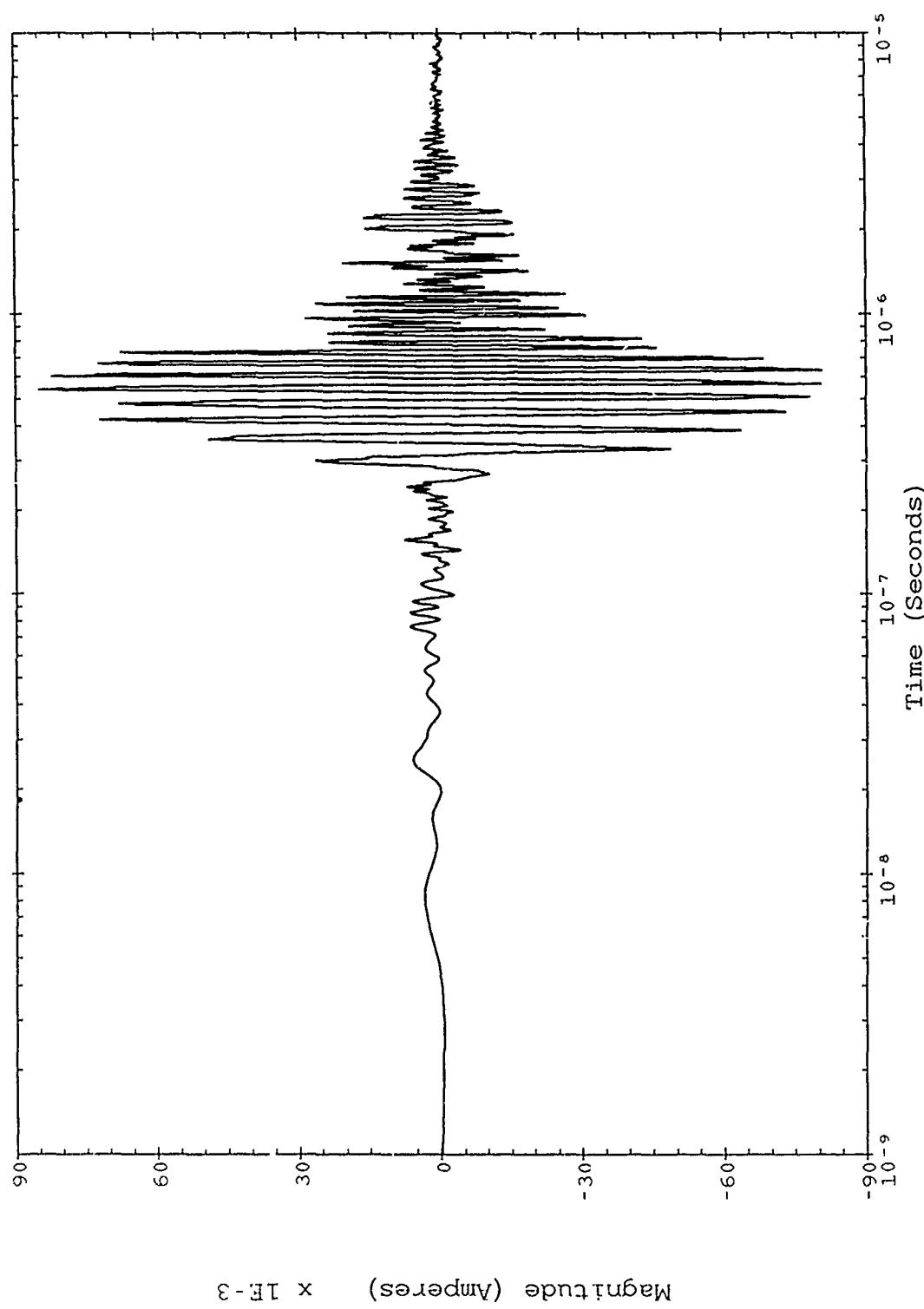


Figure B-494. Corrected TRESTLE data; TP 9893 SN 2551.

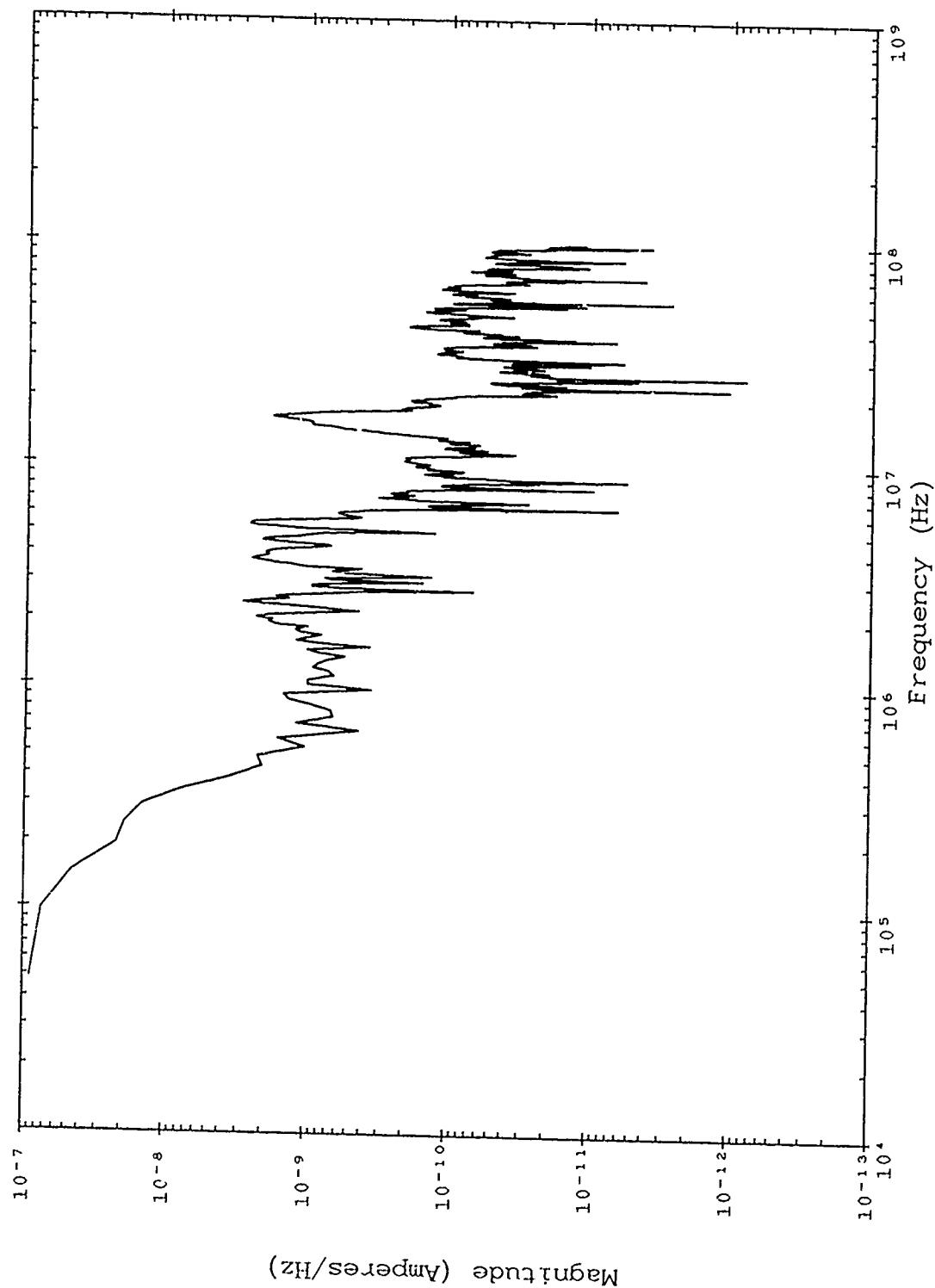


Figure B-495. Severe nearby lightning threat; TP 9893 SN 2551.

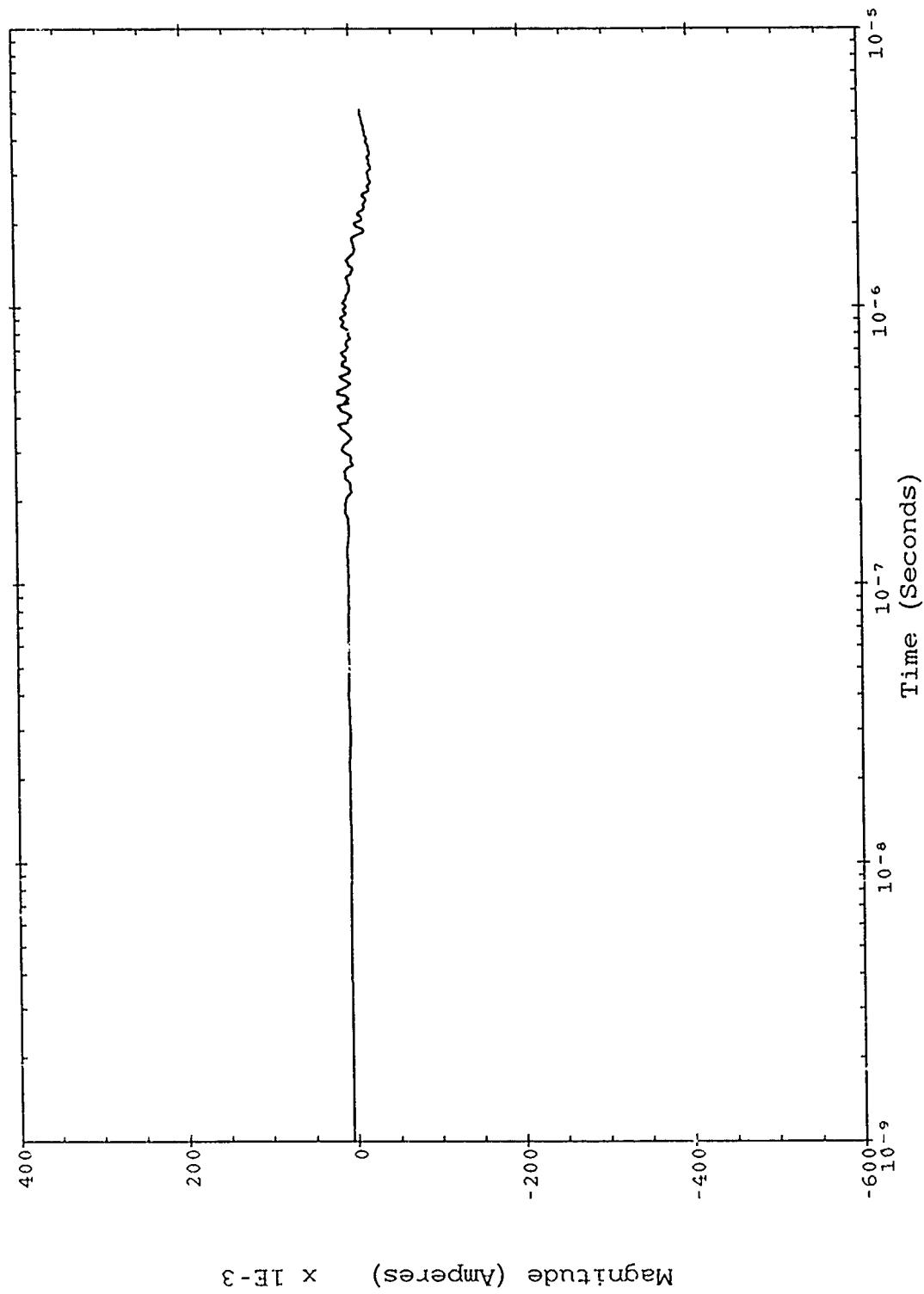


Figure B-496. Severe nearby lightning threat; TP 9893 SN 2551.

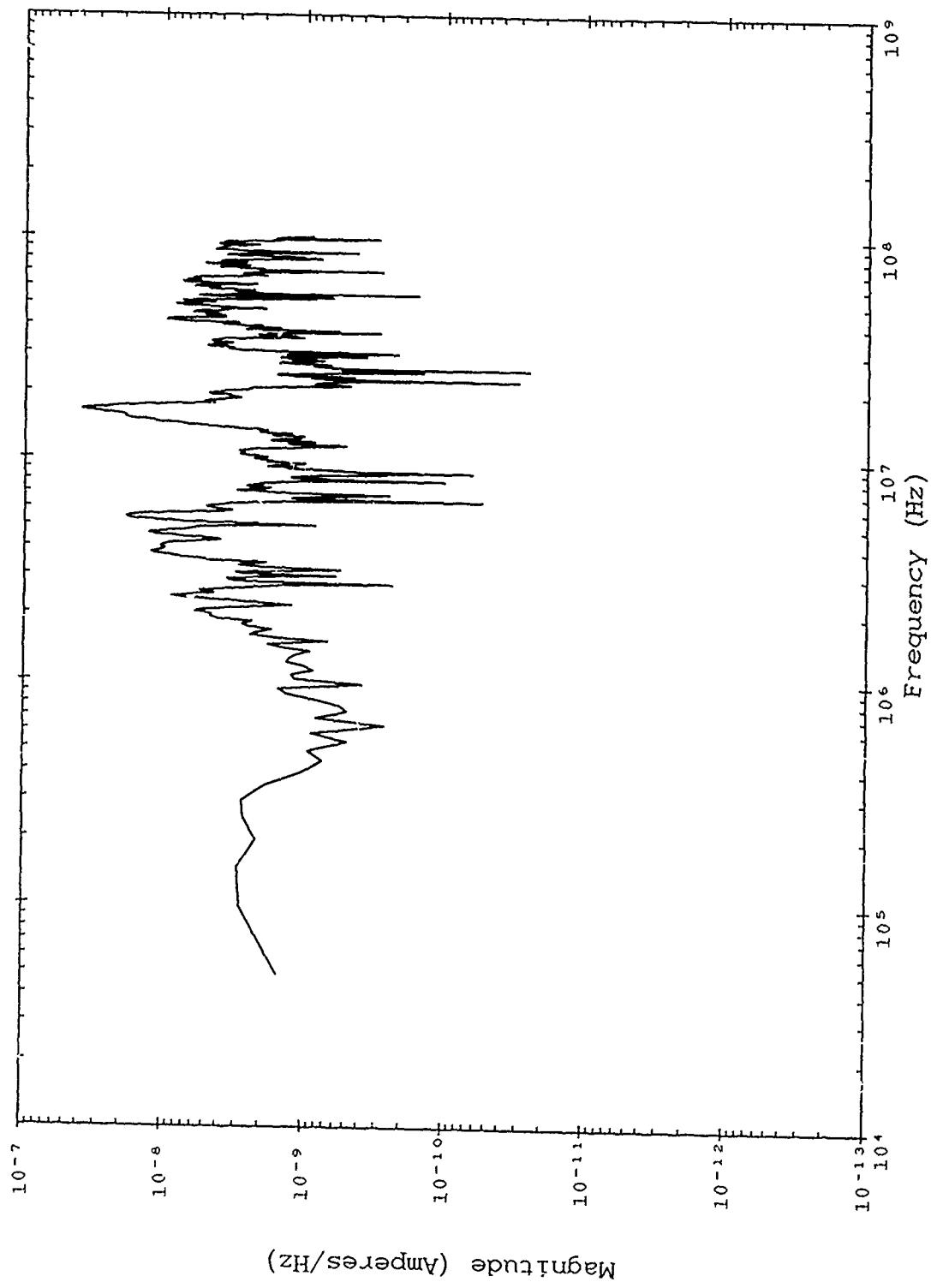


Figure B-497. Double exponential threat; TP 9893 SN 2551.

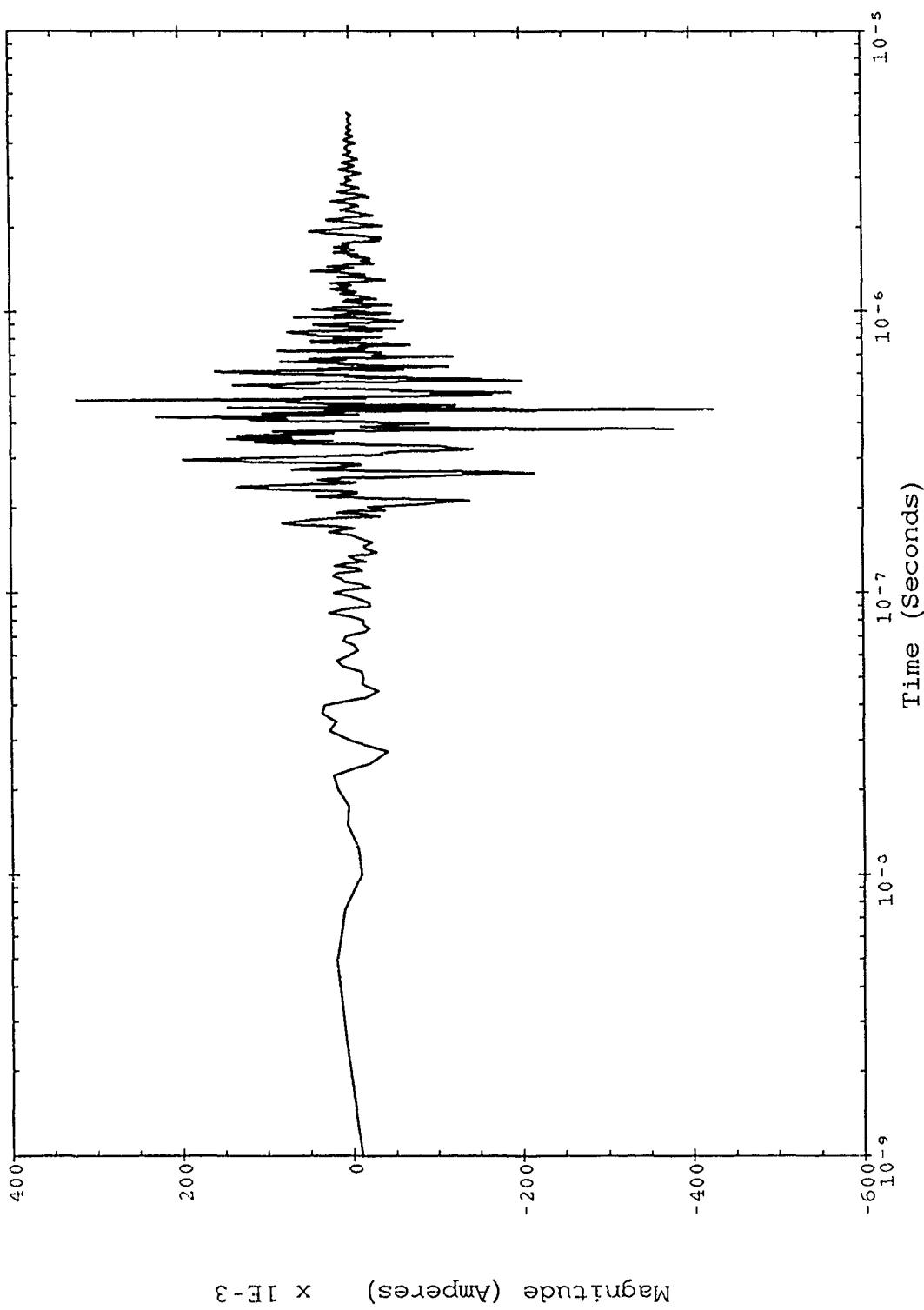


Figure B-498. Double exponential threat; TP 9893 SN 2551.

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